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OUR EXPORT TRADE.

The decadence of America's export trade in cotton fabrics is a live economic issue that should be thoroughly ventilated and handled without gloves. The numberless consular and trade reports and editorials during the past six months have contained startling figures to prove the decline of our export trade in the Orient, particularly the Manchurian section. They launch caustic criticisms and scathing reproaches at our cotton manufacturers and commission houses for the loss of exports to these countries in the Far East. There is no gainsaying the fact that certain brands of our fabrics which commanded a major market in China and the Red Sea countries up to within three years, have been duplicated by Orient buyers from Japan and Belgium cotton mills at quite a substantial difference in price; but, on the other hand, such brands as Pepperell drills continue to command the export market for this weight, and indications are that it will be many years before these drills will lose their Oriental market.

But while the China and Manchurian markets have been declining in their purchasing power for American textiles, we have developed the Manila market to a very satisfactory point, and have greatly expanded the Latin American markets for our fabrics. Before considering the export situation in a broad sense we wish to present the fact that the decline of exports to the Orient is and will be offset, to a certain extent, by the increased exports to other markets. Furthermore, it must be admitted very frankly that the stoppage of the export demand for goods to China does not very seriously dislocate the cotton textile industry of this country.

We will briefly consider the causes of the decreased demand for our fabrics in China and the Red Sea markets. The reasons for the heavy exports during and immediately following the Japan-Russian war are familiar to us all. The reaction a year later was normal, while the improvement in 1908 was due to natural conditions. In 1909, China was well stocked with spot American goods and long on favorable contracts, so that the latter part of 1909 and so far this year there has been a cessation of Chinese buying because of the disparity between prices paid for last year's spot goods and contracts. Right at this point where we note the disparity between today's prices and those prevailing in midsummer of the two previous years, we find the primary cause for the decline of American fabrics in the Orient. Today, American goods are from 15 per cent. to 25 per cent. higher than Japanese made fabrics which are being freely sold in the Orient at the low prices of 1908 when raw cotton was under 10 cents a pound in this country. The difference in quality is not sufficient to offset the difference in price, Chinamen buyers frankly state in answer to our inquiries.

Japan can manufacture fabrics out of American grown cotton at from 10 to 25 per cent less cost than our own mills, because labor in that country is so much lower than

here. The average daily wage of male operatives in Japanese cotton mills is 23 cents and female 16 cents with an abundance of child labor at 10 cents a day. The efficiency of such labor is about ⅓ to ¼ of our unskilled operatives that get from $1 to $1.25 a day. In Japan, there are over 100 cotton mills with about $32,000,000 invested and nearly 1,600,000 spindles in daily operation. The average number of male operatives daily employed is 17,000 and female over 60,000. There are 331 working days in Japan per annum as compared with 300 in this country.

These Japanese cotton mills are equipped with modern European and American machinery. One of the larger builders of textile machinery in this country has exported 17 shipments of machinery this year to Japan. English loom builders have salesmen traveling Japan, and belt makers in England have branches in that country. There are at least 400,000 American spindles and 6,000 American looms in Japan.

Belgium cotton mills are competing very seriously with America in the lighter fabrics, although as yet, fabrics from that country have not attained the quality of Japanese made fabrics.. Northrop looms are operating in a number of Belgium cotton mills at the same speed and number of picks as here in this country; but of course the efficiency of local weavers is very low as compared with this country. Belgium will some day be a formidable competitor in the export trade to the Orient.

England's relation to the export market, particularly the Red Sea and Manchuria is too familiar to us, to outline; also the importance of India in this export trade to the Orient. It is entirely reasonable to predict that America will never regain its Oriental trade on unbranded goods; but branded goods will always have a market in the Red Sea countries because of the extreme popularity of our brands that have been introduced to that trade. China will buy unbranded goods of Japan, Belgium and India so long as the difference in price is as great as it is at present between American and goods made in these three countries; but, just as soon as this disparity of prices is overcome—if it ever does—China will resume purchases of our unbranded goods.

Our branded goods hold a commanding position in the Oriental trade because of the quality of goods and popularity of brands. There are a number of Southern mills on export sheetings that have established brands of inestimable value, and just so long as quality of fabric is maintained these brands will sell in the export market. But with the decadence of exports to the Orient, we are gaining in exports to our new possessions in the Far East on account of favorable tariffs, and to the Latin American countries on account of our closer commercial and social relations with these nations. Commission houses report a very strong market for finer counts in Manila and are laying plans for a further development and broadening of this market.

Even though we are losing our Oriental trade on unbranded goods and note that our exports of cotton fabrics for the year ending June 1st, 1910 were $20,000,000 or nearly $2,000,000 less than the previous year, as compared with imports of cotton goods aggregating $37,000,000 or $1,000,000 less than the previous year, we must remember that our own home market is being developed more rapidly than any other market in the world. Our population is increasing by leaps and bounds and with the gradual evolution of social conditions, the demand for better grades of fabrics and finer counts is developing entirely out of proportion to the production.

The individual or institution that is a bear on the textile industry in this great country of ours, simply because we are having an off-year or because we are losing our export trade which never was 5 per cent. of our entire production, is courting financial and economic disaster. The great industry manufacturing cotton fabrics in the United States is having a healthy and normal reaction, just a breathing spell, as it were, on its onward march of progress and prosperity.

THE AUTOMOBILE INDUSTRY.

The 1910 production of automobiles and motor trucks in this country will approximate $350,000,000, as compared with $250,000,000 in 1909. In ten years, this gigantic industry has developed from a product value of but several millions of dollars.

That the automobile industry is a permanent institution is undisputed by economists and proven by the fact that $225,000,000 is directly invested in the manufacture of motor vehicles and $175,000,000 invested in producing accessories. This gives a total plant investment of $400,000,000 or more than 60 per cent as much as is invested in cotton manufacturing which has been 50 years developing into one of the fundamental industries.

There are in excess of 200,000 persons employed in the manufacture of automobiles; 5,500 selling agents, and 33,000 employees of agents and garages. Last year, the industry consumed 18,000,000 pounds of copper in various forms and paid $30,000,000 to railroads for transportation of raw materials and finished products. Over $10,000,000 worth of leather was consumed and about $25,000,000 worth of rubber used. This year $40,000,000 worth of steel and iron will be used and $12,000,000 worth of aluminum.

There are in daily use in the United States at present about 360,000 automobiles and motor trucks. Reliable authorities estimate that there are over 7,000,000 horse-drawn vehicles used daily in this country, while the total number of horses and colts in the country exceeds 21,000,000, besides 3,000,000 mules. American manufacturers produce yearly about $110,000,000 of horse-drawn vehicles. There is a yearly expenditure of $125,000,000 for horses and $52,000,000 for harness; therefore it appears fair to assume that the United States expends yearly for its horse vehicles a total of about $290,000,000.

Motor vehicle authorities claim that already the automobile has displaced 500,000 horses and wagons, the average upkeep of which is 65 cents per day compared with the average upkeep for an automobile of 30 cents per day.

The development of the motor vehicle is a chapter in our industrial and economic history without a parallel. The automobile is a transportation unit of great economic value and as a very important factor in the progress and evolution of this great country of ours, it is accepted by financiers and economists.

The automobile means more to the uplift and success of the American farmer than any other institution, and already there are 75,000 automobiles owned by farmers in this country. The greater mobility and the longer day afforded by the automobile aid toward a more efficient

agriculture. As an implement it is to be classed after the traction plow and it will rank next to the irrigation ditch in opening up 425,000,000 acres now inaccessible.

In this country we have about 2,000,000 miles of road, of which 1,900,000 are about as the forefathers left them. Over such roads move crops weighing more than 250,000,000 tons, for an average haul of nine miles. The cost per ton per mile is 15 cents more than in Europe, where they farm and build roads properly; and per haul the difference is $1.35, not counting the return haul of supplies, or an annual waste of $225,000,000, which, if saved, would have put last year's total crop value up to $10,000,000,000.

The automobile will break the isolation of the farm, it will put the farmer in closer relation with the markets of the world and it will be used within a decade to move small crops to town in auto trucks at a cost of two or three cents per ton per mile instead of nearly 25 cents per ton per mile as at present.

DIVERSIFICATION OF SOUTHERN MANUFACTURING INDUSTRIES.

BY W. W. FINLEY, PRESIDENT OF THE SOUTHERN RAILWAY CO.

Our interest in Southern development prompts me to write something on the subject of the diversification of Southern manufacturing industries.

Each year witnesses wider diversification of Southern agriculture. This year the area planted in corn in the States South of the Ohio and Potomac rivers and East of the Mississippi is 1,683,000 acres greater than last year, and there are increases from year to year in the areas devoted to other crops, including fruits and vegetables. This diversification is being accomplished without cutting down the production of cotton—leading agricultural product of the South. In fact, the acreage of cotton planted in the Southeastern States this year is somewhat larger than last year, and many cotton planters are adopting methods which will increase the average production per acre.

What is being done in Southern agriculture can be done with equal success in Southern manufacturing. The Southern farmer has the advantage of conditions of soil and climate favorable to the growth of a large variety of crops and admirably suited to the raising of live stock. The Southern manufacturer has the advantage of proximity to sources of supply of a large variety of raw materials. He has ample supplies of coal for the generation of power, and, in many localities, he can convert the force of stream flow into electric power to be carried to his factory. Raw materials and power are the indispensable requisites for industrial development. Where they are accessible to an energetic and resourceful people, such as we have in the South, the building up of great manufacturing communities is inevitable.

The economic strength of the South in respect to raw materials may be illustrated by comparing its advantages in this regard with the disadvantages under which important industries have been built up in other localities. Thus, in New England, there was built up a great cotton mill industry, which was done in spite of the fact that the raw material had to be transported for long distances and from our own section. The New England industry is still growing, but not nearly so rapidly as in those Southern States where the cotton mill has the cotton field practically at its door, or where it is located on a line of transportation between the field and the market for cotton goods. This is shown by the census reports on the Supply and Distribution of Cotton which show that, while in 1880 the mills of New England used nearly six times as much cotton as those in the Southern States, in 1909 the Southern mills used 409,349 more bales than those of New England. Commenting on this phenomenal growth of the Southern industry, the editor of the textile statistics in the Census of manufactures of 1905 said:

> "No fact relating to the industrial progress of the country is more important, or more significant to the student of social and economic conditions in the United States than the vigor, the persistency, and the success of the South in introducing this branch of manufactures. Combined with the manufacture of iron and steel, it marks an industrial revolution in one-half of the country."

There are other industries to which distance from sources of supply of raw materials is a greater handicap than in cotton manufacturing. An example of this is the furniture industry, as to which we may again refer to Massachusetts. When the furniture makers of that State could draw their supplies from nearby forests they ranked among the first in the United States in the production of furniture. As their nearby supplies of raw material have been exhausted, they have fallen back in relative importance, and, in the five-year period covered by the Census of 1905, actually showed a slight decline in the annual value of their products, while North Carolina showed an increase of 299 per cent. and Tennessee an increase of 193 per cent. Similar illustrations might be multiplied and numerous instances might be cited to show the advantage of manufacturing close to the supplies of raw materials.

Great as has been the development of Southern manufacturing, however, it has been, up to the present time, largely in the nature of what may be called primary manufacturing in which Southern raw materials are not prepared for the final consumer, but are converted into products which are, in turn, the raw materials for other industries. A substantial beginning has been made, however, in carrying these processes forward in the South, especially in some lines, and I believe that, while what I have called primary manufacturing will continue to develop in the South, our greatest industrial advance in the immediate future will be in converting these primary products into articles ready for the final consumer. It is in this that will be found the most extensive field for the diversification of industries.

As I have indicated, the South has already made considerable progress in the development of secondary manufacturing industries, but the opportunities for expansion in this direction are almost unlimited. Without attempting to enumerate all of the directions in which this development is possible I may suggest some lines along which there are undoubtedly opportunities for industrial diversification. The most widely developed industry of the South—that of cotton manufacturing—is capable of a much larger expansion, both in the mill industry itself and in the utilization of mill products. Even in our cotton mill towns a considerable proportion of the cotton goods sold—especially in the finer grades of piece goods, laces, and embroideries—are manufactured in New England or in foreign countries. The South sells the raw material for these goods at, say, fifteen cents a pound and buys it back, in some cases, at the rate of several dollars a pound, the difference having gone to pay

the wages of operatives and the profits of manufacturers in other localities. The South also buys considerable quantities of cotton garments, and other articles made of cotton, which are manufactured elsewhere. The home market, therefore, holds out inducements for the further expansion of both primary and secondary cotton manufacturing, and, with its manifold advantages, a more diversified Southern cotton manufacturing industry could compete successfully in the markets of the world.

Southern forests and Southern iron mines provide the bases for building up extensive and widely diversified industries. The exhaustion of the timber supply in many parts of the United States greatly strengthens the position of the South with respect to every industry using wood alone, or wood in combination with iron, steel or other materials. For many such industries, including vehicles of all kinds, and agricultural implements and machinery, the Southern demand affords market opportunities. In the same way, the industrial development of the South itself is constantly widening the opportunities for a diversified iron and steel industry, especially in the production of tools and machinery used in cotton mills and other factories.

The Southern farmer already supplies the cotton mill and the cotton seed oil mill with their raw materials. He is now devoting increased attention to live stock, which will broaden the foundation for meat packing, the industries using packing-house by-products, and tanning, with all the secondary industries using leather as their raw materials.

MEETING OF THE NATIONAL ASSOCIATION OF COTTON MANUFACTURERS.

A change in the previously announced arrangements for the meeting of the National Association of Cotton Manufacturers has been made and the 89th semi-annual meeting will be held at Hotel Wentworth, Portsmouth, N. H., Thursday, Friday, and Saturday, September 15-17, 1910. The sessions will be held in the music room of the hotel beginning at 8:00 p. m. Thursday, at which occasion President Hobbs will deliver his address, after which he will give an informal reception to the members and ladies. On Friday the sessions will be held at 9:00 a. m. and 8:15 p. m. The last session will be held on Saturday morning at 9:00 o'clock.

Secretary C. J. H. Woodbury announces that Mayor Edward H. Adams, of Portsmouth, N. H., will welcome the Association at the opening session. The program will not be issued until the meeting, but papers are expected on the following subjects: A New Textile; California Cotton; Cotton Mills of Mexico; Economical Lubrication; Economizers and Draft; Foreign Markets for Cotton Textiles; Illuminating Engineering; Moisture in Cotton; Natural and Artificial Draft—Relative Advantages and Limitations of Each; Nature and Cause of Waste Fiber in Cotton Mills; Part Time Instruction for the Textile Industry; Producer Gas Engines; Purification of Water for Mill Purposes; Renaissance of the Water Fall; Rewinding of Weft Yarn; Russian Turkestan and its Products; Textile Industry in Hungary.

The Committee on Meeting wearing white badges consists of Col. H. Martin Brown, Chairman; Col. Charles H. Child, Henry C. Dexter, R. H. I. Goddard, Jr., Gen. Lyman B. Goff, John E. Kendrick, Charles R. Makepeace, and Frank P. Sheldon.

The officers of the Association are: President, Franklin W. Hobbs, Boston, Mass.; Vice-Presidents, George Otis Draper, New York, N. Y.; Edwin Farnham Greene, Boston, Mass.. The directors are: Robert Beatty, Philadelphia, Pa.; Albert F. Bemis, Boston, Mass.; Frederick A. Flather, Lowell, Mass.; George P. Grant, Jr., Fitchburg, Mass.; David S. Johnston, Cohoes, N. Y.; Russell B. Lowe, Fitchburg, Mass.; Frederick B. Macy, New Bedford, Mass.; Joseph Merriam, Middletown, Conn., and R. M. Miller, Jr., Charlotte, N. C.

OBITUARY.

News was received on August 22 of the death of Chas. K. Oliver, Baltimore, Md., on board the German-American liner "Grosser Kurfuerst" en route to this country. Mr. Oliver was vice-president of the Consolidated Cotton Duck Co., of Baltimore, and chairman of the Board of Directors of the American Cotton Manufacturers' Association. He was born in Elkton, Md., about 55 years ago and was educated at St. John's College, Annapolis. After graduating in 1870 he went to Baltimore and entered the employ, as a clerk, of the Druid Cotton Duck Mills, which were operated by the Gambrills. When these mills went into the hands of a receiver, Mr. Oliver was made general manager, which position he occupied with great credit to to himself making the mills settle their indebtedness dollar for dollar.

CHARLES K. OLIVER.

Mr. Oliver afterwards built the Columbia Mills at Columbia, S. C., which were afterwards merged with the Mt. Vernon-Woodberry Cotton Duck Co., which was the nucleus of the United States Cotton Duck Co., and which later became the Consolidated Cotton Duck Co. Only recently the International Cotton Mills Corporation was organized which took over these mills. He was treasurer of the Mt. Vernon Co. and retained that same office with the United States Cotton Duck Co. He was elected president of the Consolidated Cotton Duck Co., which position he held until last year when he was succeeded by Thos. Turner. Mr. Oliver's health failed him last summer and he never fully recovered. Previous to his chairmanship on the Board of Directors of the American Cotton Manufacturers Association he was vice-president of that Association.

Water Power in the Carolinas.

(Contributed exclusively to COTTON.)

BY J. N. INGRAM.

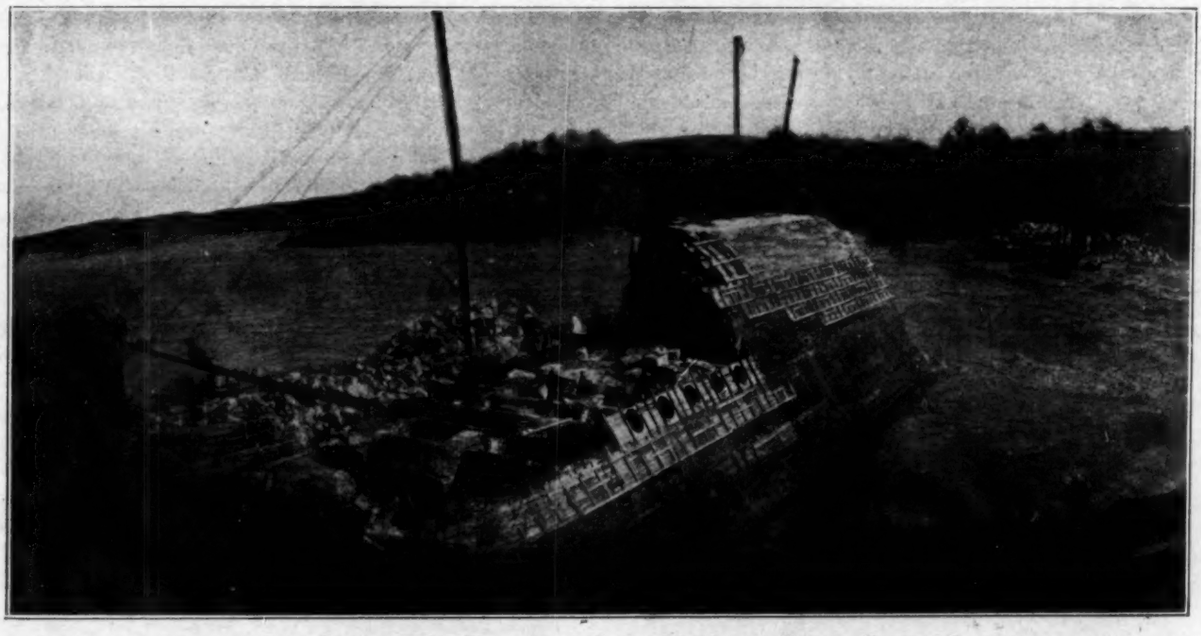
Cotton manufacture has long been a leading American Industry. Cotton goods are a chief commodity of American export. The values of American cotton goods exported in 1908 were; unbleached goods 101,833,072 square yards valued at $6,930,072; bleached cloths 23,896,769 square yards valued at $1,529,057; colored 80,264,971 square yards valued at $5,809,019; apparel valued at $4,701,479; waste 45,484,473 pounds valued at $2,631,595; yarns and thread valued at $400,600; other goods valued at $3,176,001.

Power for the economical manufacture of cotton products is valuable and necessary as is the soil area for cotton production. Power located near the site of cotton cultivation economizes transportation expenses and increases its value. The cotton region in North and South Carolina holds water volume adequate for much of the power required for American cotton manufacture. Nature has stored in the Carolina rivers force for the manufacture of a vast proportion of this textile staple. Southern financiers have combined to utilize the great water power flowing unchecked to the sea. Companies have been formed in various parts of the cotton region to harness local river currents into the manufacture of cotton goods.

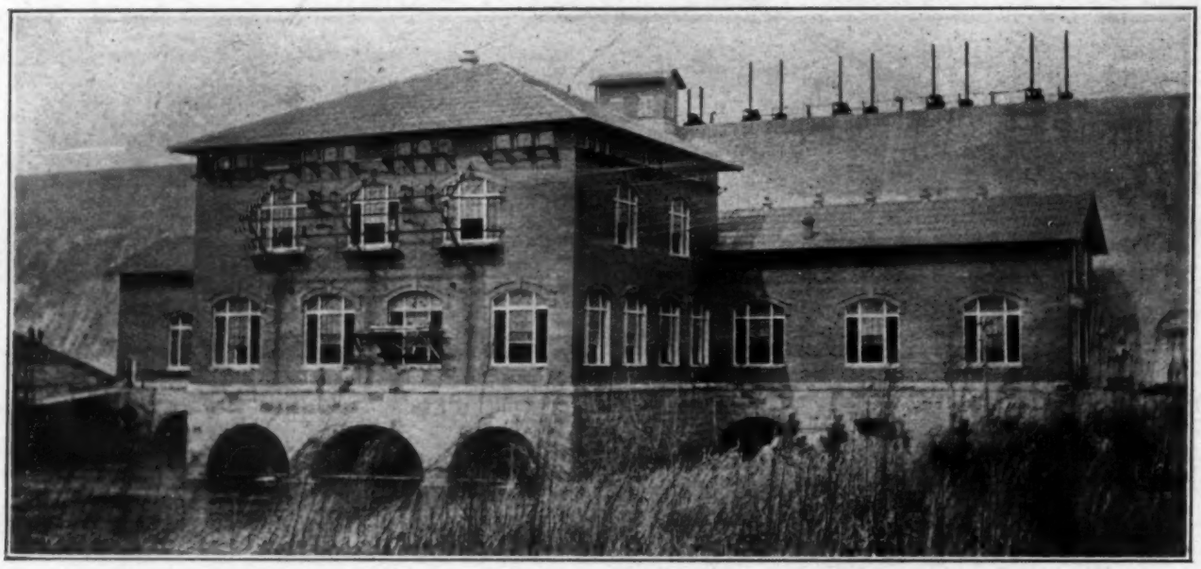
The Carolinas have been the arena in which much development of Southern water power has been effected. The creation of such force has reduced the cost of cotton manufacture, increased the profits on textile production and enlarged the output of Carolina cotton goods mills. Capital has been attracted to that part of the cotton section; many new mills have been erected, and old factories have enlarged their capacity. The western part of the Carolinas has been transformed by its developed water power from an agricultural region to a manufacturing center. New mills are erected every year with motors to receive electric power to turn the great plants that are being constructed over the Piedmont country. Steam has given way to the cheaper electric current. Many of the old mills have torn out their steam systems and introduced electric power. Wood consumption and coal expense are thereby saved, Southern forestry is protected, and decreasing timber resources are preserved. The mountains and hills amongst which the streams originate, furnish the water volume to generate the electric power; forests attract the clouds to produce the water currents; timber protection is therefore a river and electric necessity.

The Catawba Power Co. was the pioneer Carolina electric producing source. It controlled 7,000 acres on the Catawba River in York county, S. C., 15 miles southwest of Charlotte, for the location of an electric station. Work was begun in 1900. Several hundred men were employed in the labor of construction. The plant was finished in April, 1904. A dam 850 ft. long and 35 ft. high was erected across the Catawba River. The fall there is 25 ft. The station has eight dynamos. The plant develops 10,000 H. P., and is valued at $1,500,000. In 1904 the Catawba Co., was reorganized into the Southern Power Co., and capitalized at $7,000,000.

The phenomenal increase in the number of cotton factories in adjacent counties, the ready sale of all available electric power, and the increased demand for the subtle current, induced the establishment of other electric plants to supply existing wants. The Southern Power Co., secured 15,000 acres on Rocky Creek, and at Great Falls in Chester county, S. C., and began construction of two additional electric stations. Work was begun at Great Falls in 1906, 1,000 hands being employed. Two dams were built: A bulk head dam 650 ft. long, 104 ft. high; and the main dam 800 ft. long and 40 ft. high. The station was completed March 1907. The fall there is 75 ft.; eight dynamos are operated. The plant is valued at $1,500,000 and 40,000 H. P. is produced.



SPILLWAY IN PROCESS OF CONSTRUCTION AT ROCKY CREEK STATION.

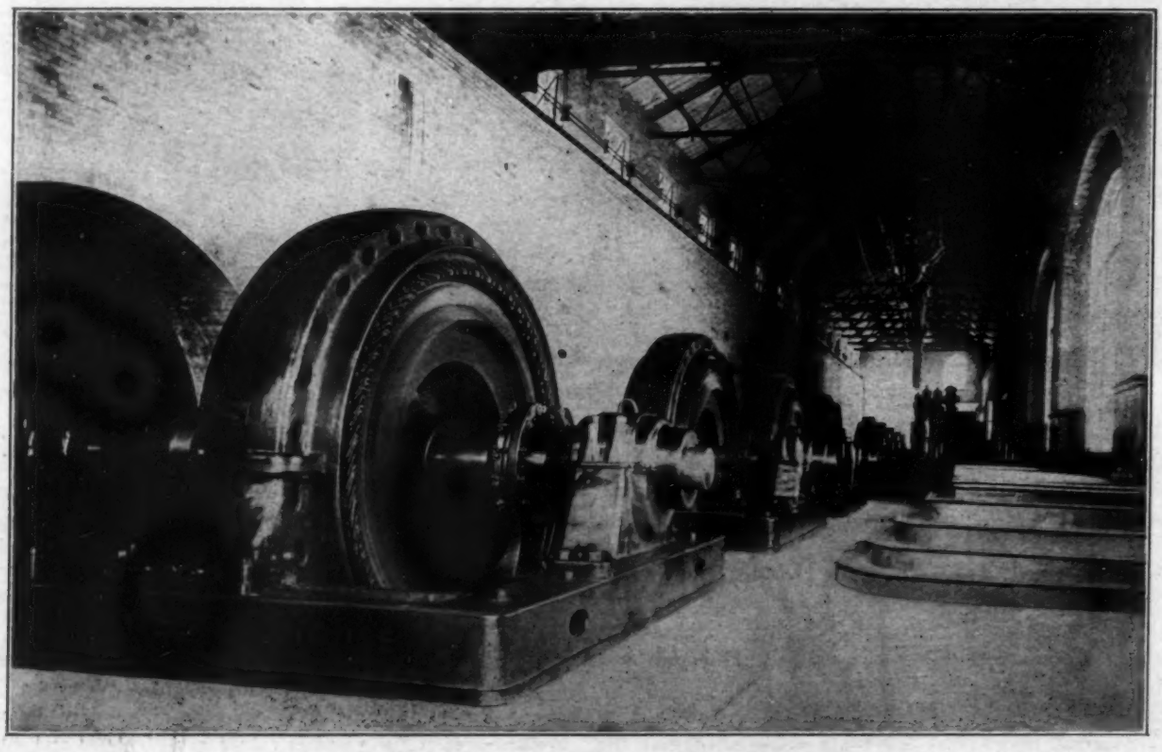


VIEW OF POWER HOUSE AND DAM AT GREAT FALLS, S. C.

At Rocky Creek, two miles south of Great Falls, the Southern Power Co., in May 1907 began construction of a third station. One thousand workmen were engaged and two years were expended in the work of erection. One dam was built 1,800 ft. long and 65 ft. high, and eight dynamos are operated producing 40,000 H. P. The plant is valued at $1,500,000. The station was completed April 21st, 1909. Rights of way over the surrounding country had been secured, poles erected, cables stretched, and power engaged to adjacent mills. An electric current of 40,000 H. P. was immediately started over the cables to factories in two States.

The three stations, Catawba, Great Falls, and Rock Creek produce 90,000 H. P., have 750 miles of overhead cables, and employ 1,500 men. They send electric power over an area of 100 square miles, operate in 35 towns in North and South Carolina, and turn the machinery of 105 cotton mills. The company is now capitalized at $11,000,000. It owns the water power for 110 miles along the Catawba River; and has paid out $3,000,000 for station sites. It expects to develop 250,000 H. P. at its electric plants, and operate over an area 150 miles long and 100 wide. Its headquarters are at Charlotte, N. C.

Charlotte is a city of 45,000 people. It has 23 textile mills, 20 cotton factories, which with other manufacturing establishments make an annual production of $10,725,000, and pay a yearly wage sum of $1,655,840. Within 100 miles are 369 cotton factories, operating 110,000 looms and



VIEW IN THE DYNAMO ROOM OF THE GREAT FALLS STATION.

4,755,000 spindles, with a capital investment of $140,000,000. Within 60 miles of the City, water power capable of producing 1,000,000 electric H. P. is located. It will be further developed as manufacturing demands require.

This staid region of Scotch Irish ancestry, arena of Mechlenburg Declaration, theatre of Revolutionary patronism and of Kings Mountain, home of the Hornet's Nest, cradle of Andrew Jackson and James K. Polk, is fast changing from rural rusticity and colonial characteristics to a scene of manufacturing activity; it will soon be covered with new villages, occupied by strange races, with foreign customs, costumes and language. The typical American population will become cosmopolitan, with varied complexions and tongues. What has been done, and will be done in the Carolinas, will be accomplished at an early day in other cotton growing States. The South will monopolize, by electric power, cotton manufacture. The fleecy lint will be woven close to its production. Cotton export to a distance and to mills across the seas, will decrease; Dixie will become the chief manufacturer as well as the chief cotton producer.

"CAROLINA MILL RULES."

RULES FOR THE PURCHASE OF COTTON, ADOPTED BY THE COTTON MANUFACTURERS' ASSOCIATION OF SOUTH CAROLINA, AND THE COTTON MANUFACTURERS' ASSOCIATION OF NORTH CAROLINA, JULY 1, 1910.

I. CONTRACTS.

All sales made by shippers direct or through brokers to mills, either by telegraph, telephone or verbally, must be confirmed in writing by both parties to the cotnract without delay.

II. CLASSIFICATION.

(a.) All business between cotton merchants and mills will be based on "American Standard Classification;" cotton is to be ordinary length of staple for uplands grown in sections from which the cotton is to be shipped, the section to be stated at the time of sale. When a contract calls for even running grades ten per cent. of the shipment may be one-half grade below the grade specified, if offset by an equal number of bales one-half a grade above the grade specified, and any excess over such ten per cent. may be rejected by mill and must be replaced within ten days by seller.

(b.) Where the grade sold is an average grade, nothing below a grade specified, there must not be an excess of more than ten per cent. of the lowest grade over highest grade specified, and the buyer may reject any excess over ten per cent. thereof.

III.

(a.) Merchantable bales of cotton, weighing 300 pounds or more can be delivered on contract. Where cotton is sold for prompt or immediate shipment, the weights shall be a fair average of cotton being shipped at such time from the section from which cotton is shipped, but where purchase is for forward shipment, that is, one, two, or more months in the future, the basis of all sales shall be a weight of 50,000 pounds to each 100 bales, with one per cent. variation each way, and seller must ship more or less bales than sold to make the total weight of each month's shipments equal the above requirements.

(b) Shippers must furnish the mill with a detailed certificate of weight for each mark shipped.

(c) All cotton must hold out in weight with invoice. The re-weight of each contract of sale to be considered as a whole, provided not more than ten days elapse between the first and final shipment upon such contract, and if more than ten days thus elapse, the re-weights of shipments occurring within the ten days to be considered as a whole, and each shipment occurring after the ten days to be considered by itself.

IV. TARE.

On compressed cotton the tare shall not exceed twenty-four pounds, and on uncompressed cotton twenty-two pounds per bale, and any excess constitutes a just claim against the seller.

V. SHIPMENT.

(a) Cotton sold for prompt shipment must be shipped and bills of lading dated within fourteen days from date of sale; for immediate shipment within seven days.

(b) When a sale is made for shipment in a certain month, cotton may be shipped at any time that shipper may elect during the month specified, but shipment must be made, and bills of lading dated within the month specified. If for delivery at shipper's option, cotton may be delivered at any time during the month, but must be delivered within the month specified.

(c) When the time of "shipment" or "delivery" specified in the contract has expired, and the cotton contracted for has not been "shipped" or "delivered," the contract shall be closed for the portion in default, and settlement immediately made at the difference between the price of sale and the price at which cotton of equal quality may be secured for immediate shipment to the place of delivery as specified in the contract, and the seller shall pay in addition one-fourth cent per pound penalty for default; *Provided,* however, that when owing to congestion of traffic the shipper is unable to have cotton loaded or delivered within the contract time, and shall furnish buyer a duplicate bill of lading showing the cotton is in possession of the transportation company or furnish other satisfactory evidence that the cotton is ready for shipment, the contract for this portion of the cotton shall be extended for twenty days and shall not lapse nor penalty apply until the expiration of these twenty days. When contracts are closed in this manner the weights per bale shall be taken at 500 pounds.

(d) All bills of lading accompanying drafts must show the loading of the cotton, i. e., the initials and numbers of the cars and the number of bales therein, and the weights shown on bills of lading must agree with the invoice weight, and the following certificate signed by the initial bank forwarding the bill of lading must also appear thereon, to-wit: "We hereby certify that the signature of the agent of the railway company whose name is signed to this bill of lading has been acknowledged by him as genuine, and that he has acknowledged to us that the said railway company is in possession for shipment of the cotton specified therein."

VI. PAYMENTS.

Unless otherwise arranged, shippers will draw at sight on the mill treasurer with bill of lading attached to draft for payment; drafts to be without exchange or collection charges. Buyers not paying drafts within three days after notice shall pay the legal rate of interest on face of same until paid and an additional penalty of one-sixteenth of a cent per pound; provided, that this last clause does not give the mill any right to delay payment, nor does it abrogate any rights which the shipper may have under his contract.

VII. RECLAMATIONS.

(a) Buyer must weigh all cotton immediately upon its receipt at destination unless too damp or wet to be re-weighed with reasonable accuracy, in which event shipper must be immediately notified so that he can send his representative to the mill if he desires. Buyer must at once furnish the seller statement covering each mark and showing re-weight of each bale. Such statement must be certified and signed by weigher. Certificate as above must state that the weights as given are true and correct without reduction or allowance of any sort. If any deduction is claimed for over-tare or any other cause, such fact must be stated on certificate giving the number of bales upon which claim is made and detailed items of same.

(b) When shipment arrives at the mill, large and fair samples of each bale shall be taken by the mill, after the cotton is weighed, and from well within the bale, and shall be properly held for future inspection.

(c) All claims against shipper must be made by the mill as promptly as possible after cotton is delivered at the mill and must be covered by sworn certificate from the mill's weighers and classers when request is made therefor.

(d) Claims for loss in weight or exterior damage must be made within five days from the date of receipt of the last portion of shipment unless conditions are such as render this impossible, in which event the claim must be made within ten days.

(e) Claims on grade must be made within ten days from the date of receipt of last portion of the shipment unless conditions render this impossible; but under any circumstances must be made within twenty days. Claims on grade shall be based on each separate month's shipment called for in contract.

(f) Upon receipt of complaint by shipper from mill, the shipper must within five days notify mill if he desires to further investigate out-turn of cotton, and must within ten days from receipt of such notice send representative to make such investigation and agree upon settlement. *Provided,* however, that in cases where it is necessary, the shipper and the mill may agree before shipment, that re-weights shall be accepted by shipper subject to the right on the part of the shipper to test and approve the correctness of the scales and weights of the mill, and where practicable, to re-weigh a portion or the whole of the shipment. If the cotton is re-weighed at the request of the shipper, the party found in error shall pay any expense of re-handling; and it is further provided that where the re-weighing of a shipment has been entered upon, either the buyer or seller shall have the right to insist upon the entire lot being re-weighed, and settlements made accordingly.

(g) Claims for fraudulently packed bales may be made at any time within one year from the time the cotton is received at the mill.

Notice of claim for excess tare must be made by mill to seller within ten days from the receipt of cotton at mill, and seller, if he wishes to make further test of tare, must, within five days of receipt of such notice, advise the mill in writing of his purpose to do so, and must within ten days of receipt of such notice, send to the mill his representative, who, upon failure to agree with the mill upon a certain number of bales to be tested, as representative of the lot of cotton claimed upon, shall have the right to strip and weigh, at his own expense, the tare from as many bales as the mill can conveniently use from day to day, until the entire lot has been tested; *provided,* that where delivery of cotton is accepted by the mill at some other warehouse than its own, notice of excess tare hereinbefore provided for may be given within ten days after arrival of cotton from such warehouse at the mill.

VIII. ARBITRATION.

(a) In the event of disagreement between shipper and mill upon grade, weight, tare, or other claim, the matter shall be settled, if possible, by friendly agreement. If not, then as below stated.

(b) If the mill and the shipper can agree upon a third party who is conversant with the conduct of the business, the question shall be submitted to such third party, and his judgment shall be final.

(c) If this cannot be done, the mill shall select one arbitrator and the shipper shall select one (these arbitrators being persons having no connection with either of the contending parties), to whom all questions shall be submitted by both parties to the dispute, either verbally or in writing, and in the event these two cannot agree, they are to select a third arbitrator to act with them, and the judgment of the majority of the three shall be final.

Upon the failure of the arbitrators representing the mill and the seller to agree within thirty days from the final submission upon a third arbitrator to act with them—if the appointment of such arbitrator shall become necessary—either of the principals to the dispute shall, in such case have the right to call upon the president of the Cotton Manufacturers' Association of the State in which the mill is located to appoint such third arbitrator; *provided,* however, that in any case arising where the president of such association, or any mill represented by him, is interested, the appointment of the third arbitrator as above provided shall be made by the vice-president of the Cotton Manufacturers' Association of the State in which the mill in question is located.

(d) If the dispute be as to grade, the samples drawn by the mill shall be submitted, unless the seller claims the right to have new samples drawn, in which event samples of cotton shall be drawn by either party with the consent of the other, or by a third party in the presence of both parties. *Provided,* however, that in cases where it may be impracticable to have samples subsequently drawn, the cotton not so sampled shall be assumed to be of the grade invoiced.

(e) In any arbitration the party against whom the decision is rendered, shall be liable for expense of arbitration, and if the party making claim shall be sustained in part he shall be deemed to have received the decision, except in a claim for loss in weight, where the re-weights must show a loss averaging more than one pound per bale in order for claim to be considered as sustained.

(f) These rules shall apply as to staple cotton, except in matters of length of staple, grade and differences, consequent thereon, which shall be arbitrated in New Orleans or Vicksburg, under the rules of the New Orleans or Vicksburg Exchange, at the option of the buyer.

IX. COUNTRY DAMAGED COTTON.

Country damaged cotton will not be received unless put in condition by shipper.

X.

In absence of other agreement, differences ruling on New York Cotton Exchange at date of sale are to be used in settling claims under all contracts, except that one-eighth differences are to apply on one-half grades from strict good middling white to strict low middling white, both inclusive.

Unless specific agreement is made otherwise in writing, these rules are to govern in the determination of any differences between shipper and mills.

OUR MOUNTAIN PROBLEM AND ITS SOLUTION.

BY THOMAS R. DAWLEY, JR., FORMER SPECIAL AGENT, BUREAU OF LABOR, WASHINGTON, D. C.

It is not many years since our mountain cabins were the abiding places of the Red Men, the bear, wildcats and deer, because 100 years is not long in the life of a nation. The mountains to which I refer extend from the southern border of Pennsylvania through the Virginias, Kentucky, Tennessee and the Carolinas, into Georgia and Alabama. The Blue Ridge, coming down through Virginia and North Carolina, swings around into South Carolina, forming its northern border, and meeting the Great Smokies, which form the eastern border of Tennessee, merge into the great mass of mountains that descend into Georgia and Alabama.

In the early days of our history a class of people invaded these mountains whose natural instincts led them to prefer the life of the hunter and trapper to the more settled pursuit of farming. They contested with the Indian his prerogative of chasing the bear to his den, and with him they became embroiled in many a bloody fight. Close on their heels came the refugee from war, and from the stockade and prison. As our civilization progressed westward, the farmer, with his characteristic hunger for land, sought the fertile valleys along the rivers, and between the mountain ranges, in which to produce bountiful crops, build a home, and rear a family, like the Saxon of old who invaded England nearly a thousand years before.

As the object of my investigations in the mountains was to study the class of people who have in recent years been drawn to the Southern cotton mills, the well-to-do farmer, as a class, was soon eliminated from the course of my investigation, for it is not the farmer who owns a farm, and makes even a fair living, who takes his family to a cotton mill. My studies then had to do chiefly with the poor, the poverty-stricken, and in many instances the hungry and forlorn.

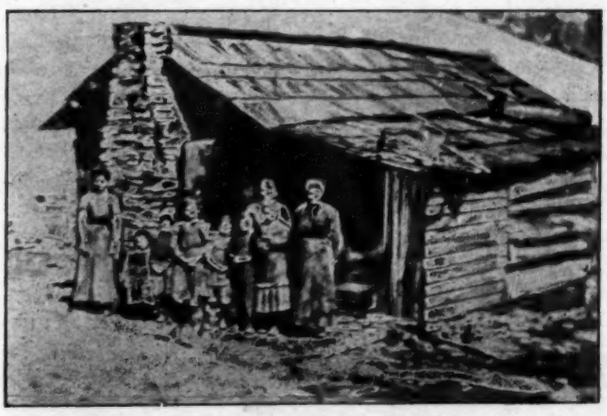
Many of us may doubt that there exists a degree of poverty in these mountains to the extent that any of the people are hungry, but when I tell you that I have found family after family huddled together in their miserable cabins all winter long, with no other food than coarsely ground unsifted meal, a little fat pork and black coffee, if we class coffee as a food—you can readily believe that they are hungry.

I have seen the poor people of the mountains in the dead of winter, in their little cabins with the storm whistling all around, their hungry, half-clad children hovering over a scanty fire in the fire-place, with scarcely a stick of wood cut to replenish the same. I have seen the snow blown between the unchinked logs of their cabins, and swirled across the room on a sudden blast of wind, the feathery flakes melting upon their bare hands, and feet of the little children extended to the fire.

I have found these children as young as three years chewing tobacco. I have been told that mothers give it to their babies; fathers and mothers both chew it; little girls chew it; and I have found the chief expenditure of many a household was for tobacco. I have had the children tell me that they chewed it because they were hungry; and that they were always hungry. They have told me that they never played because they had nothing to play; they did not know how to play. And they have told me that they got so tired doing nothing that they did not know what to do. As for their education, I have found them who had never gone to school, or church or Sunday-school. At the ages of 16, 18, and 20, they are stunted in mind and body, and when they are 40 they are broken down in health, and in many instances they are physical wrecks.

You may say that these conditions are exceptional; that I am only describing isolated cases; but in order to show to what extent the conditions were exceptional I confined my work specifically, within townships or districts. In these districts a house-to-house visit was made, and the conditions under which each family lived were recorded on a printed schedule. When these schedules were completed they showed, in each case, the kind of house the family lived in, its furnishings, sanitary condition, distance from a town, post office, school, doctor, etc. They gave the number of children in the family, their ages, physical condition, literary, educational facilities, and social and moral surroundings, with the area of land cultivated, crop harvested, and family income during the year, and the kind and quantity of food consumed. In order to obtain these schedules, I and my assistants traveled over many miles of mountain territory, hunting the people up in their isolated coves, following them up the creeks and to the tops of mountains fully 5,000 feet high. We found them miles from the highway, and frequently had to make our visits to them on foot over a narrow trail leading to their ruinous abodes.

When the work was completed in a township or district, the schedules showed just how typical each case was of the entire group, and for the purpose of forming an idea of the general conditions the families were grouped or classified according to their economic condition. As an illustration, I have at hand the summary of conditions as found in one of



A FAMILY AND THEIR RESIDENCE IN THE MOUNTAINS.

the first townships in which the work was carried on. This summary shows that there were 126 families in the township. Of these 126 families, 16 were rated as well-to-do farmers, enjoying the comforts of civilized life. Only 10 of these farmers, however, owned their farms, the other 6 renting theirs. The remaining 116 families in the township were classified as follows: Poor land owners, 46 poor tenants, 28; very poor land owners, 6; very poor tenants, 30. The schedules showed that scarcely one of those 116 families was able to make a living from the land they owned or occupied, and the conditions under which they lived were de-

plorable. The cash income of the majority of these rarely exceeded $10 a year.

This township contained, approximately, a population of 800. It was divided into four school districts, with a total of 376 children of school age. Each district was supposed to have school four months during the year, but my investigations showed that one of the districts had no school at all, and that one of the others had school only part of the time, for the alleged reason that there were not enough scholars in regular attendance to warrant keeping it open.

This district may be taken as an exemplification of the mountain problem. Less than 100 years ago a man by the name of Buchanan had settled there. Along the creek were alluvial deposits protected by the trees of a primeval forest, above which rose the rocky cliffs of mountains on either side. A cleared patch in the forest produced for this settler and his family an abundance of corn, and for meat he hunted the bear and deer. As his family increased other cabins sprang up in the neighborhood, and the forest trees were felled to make room for more corn. Since then the forest has completely disappeared; the alluvial soil has been washed away by mountain freshets, and the original settlers increasing and multiplying have married and intermarried. Two-thirds of the people along the creek bear the name of the original Buchanan. A number of them are epileptics, due undoubtedly to this intermarriage, and the problem facing them all is how to get sufficient clothing and food to sustain life.

The solution of this problem is the cotton mill. Some of you know that this is true. Many of you may not know it, and you may ask:

"Why the cotton mill?"

To be frank with you, the cotton mill is the one industry that gives employment to children, and work that it suitable for young hands to do. And these people of the mountains must be given work while they are young. If you leave them in their isolated coves and mountain retreats until they are too old,—until they are set in their ways with generations of idle habits and lack of thrift behind them,—you can do nothing with them in a cotton mill, or any other kind of a mill.

As a part of my investigations I hunted up those families who had gone from the mountains to the cotton mills. I obtained a record of their conditions in the mountains before going to the mills, and I followed them up to the mills to ascertain what had become of them, and whether they had improved their condition or not. The first of these families was one of the Buchanans, whom I have told you about, living in that densely populated, unproductive moun-

A Mountain Family Before Going to the Mill.

A Family of Women on the Farm.

tain district. Eight years previous to my getting his record he was living with his wife and children in a log house, in poverty and ignorance, with scarcely any of the advantages of civilization. Some one told him about the cotton mill, and as his corn crop was insufficient for the coming winter, he sold his few belongings and went to the cotton mill. At the cotton mill he obtained employment for himself and his oldest children, while the younger ones were sent to school. His oldest boy went to night school, and desiring an education, as soon as the family exchequer warranted it, he left the mill and went to the day school, where he pursued his studies until he graduated. The father, on a visit to his old mountain home, told his former neighbors and relatives, as an illustration of the prosperous conditions at the cotton mills, that he had given in $200, a part of his savings, for taxation, and the tax assessor had told him that they took no account of such small amounts as that.

Of 300 families whom I traced to the cotton mills, fully 90 per cent. of them showed similarly improved conditions. Among them were moonshiners who had fled from the revenue officers; farmers whose lands no longer yielded them a subsistence; widowed mothers who could not support their children, and even nomads who had never worked, and never would work in their lives. These latter would not work at the mills, but they would let their children work, and I say that it is much better to let these children work and acquire habits of industry than to legislate them back to the mountains to continue with the indolent habits of their forbears.

At the cotton mills I have seen these children of the mountains going to school. I have seen the little tots in the kindergartens, singing merrily around to the songs of the teachers; I have seen their sewing classes, in their night schools, and I have seen the older ones in the mills at the spinning frames. I have seen with what degree of intelligeene they progressed at their work, and I have found them where they have not only lifted themselves from poverty and ignorance by the skill of their own fingers, but I have found them where they have become second hands, bosses, superintendents, stockholders, and even mill presidents. Let us then give due credit to the cotton mill, and if there are evils in the employment of children in our cotton mills, let us search out those evils and stop them, but not bar the progress of our mountain people through the doors of the cotton mill.

Mill Conditions and Market Reviews.

SOUTHERN MILL SITUATION.

(*Special correspondence.*)

The question of curtailment again claimed the attention of Southern cotton manufacturers during the month of August. And the end is not yet. One of the most conservative authorities in the South on matters pertaining to the milling industry, when asked for an estimate of curtailment, gave it as his opinion that curtailment among both cloth and yarn mills from the first of July to the end of August has been at least 50 per cent. And this percentage will be kept up until September 15th, in his opinion, if not later. It all rests with the trend of things after that date. In a sense the matter of curtailment, in actual operation, has been somewhat of an individual matter, although it is true that mills have acted in concert in the movement. One mill perhaps found it better to shut down entirely for say two weeks, while another preferred to close down every other week, while still another found it wisest to run part of the time each week. As a general thing, however, mills have curtailed every other week.

It is confidently believed by men who have studied the situation that by fall there will be a decided improvement in all lines of the industry. In fact, the past two weeks have witnessed an unmistakable clearing up of the situation in yarn circles. Demand was stronger, and prices reflected considerable improvement. The markets have not, however, improved to the extent that would warrant regular operations. Manufacturers can not pay 16 cents for cotton, and sell at current prices with any margin of profit, and so long as this is the status operations will go along irregularly. Reputable authorities state that there is no serious accumulation of stocks either North or South, of either yarns or cloth. This being the case, it is believed that when the price of the new crop is settled upon, and commission men who have sold ahead without having bought to fill orders, will enter the markets freely, the result will be that prices on all counts will take an upwardly direction.

There is always more or less uncertainty in business just preceding a new crop, and the irregularity of prices and demand today are attributable in a degree to this fact. It is believed that when the improvement does set in it will be steady and rapid. It is said there is a large oversold shortage in yarns today, and that buyers are bound to become aggressive by fall in order to fill orders already booked. The yarn markets have reflected more improvement recently than has been evidenced in the cloth markets.

In anticipation of the inevitable return of flourishing conditions capitalists continued to invest freely in new mill properties, and the month of August was a banner month in new mill construction work and in amount of additional equipment added to established plants. Numerous big mills have been organized in almost every Southern State. An idea of the activity in this line may be had from the following partial list of new mills projected during the past three weeks in South Carolina alone: At Chesnee, a $400,000 mill; at Laurens, a $400,000 mill; at Newberry, a $400,000 mill; at Gray Court, a $400,000 mill; at Florence, a $300,000 mill; at Prosperity, a $200,000 mill; at Clinton, a $300,000 mill; at Fountain Inn, a $300,000 mill; at Williamston, a $300,000 mill, and at Greenville, a $200,000 mill. Here is represented in one State an investment of over $3,000,000.

An interesting report has just been issued relative to the textile industry in Spartanburg county, S. C. According to the statistics sent out from Spartanburg there are more cotton mills in Spartanburg county than any county in the South, there being 25. These mills have a total of 733,442 spindles, and 19,247 looms. They represent a total investment of $11,077,823. In the year 1909, the bales of cotton consumed by these mills numbered 193,901, which at 13½ cents cost $6,081,568. The value of the manufactured goods was $12,429,731, or over twice the cost of the cotton. There are 9,317 persons employed in the 25 mills.

In North Carolina, and other States, numerous new mill corporations were organized during the month. A $250,000 mill for Winston Salem; a large mill for Moore county; the Phoenix Mfg. Co., capital $200,000 at Kings Mountain, and other corporations were announced.

There is the liveliest interest among South Carolina cotton manufacturers over the fight with the railroads for cheaper rates on coal from Tennessee and Virginia coal fields. It will be recalled that the protest of manufacturers was recently placed before the Interstate Commerce Commission due to the railroads having announced their intention of raising rates on coal. The move of the railroads called forth a storm of protest from cotton mill men, and the fight will be carried to the bitter end. Counsel has been employed, and a determined effort to prevent the new rates will be made. The Chamber of Commerce of Greenville, S. C., and other trade organizations, as well as the South Carolina Cotton Manufacturers' Association have gone on record as protesting against the proposed rates. At a recent meeting of mill men no coal for the year was bought, manufacturers refusing to buy at the proposed rates of shipment.

Comptroller-General Jones of South Carolina has ordered a reduction in the assessment of values of 13 cotton mills in South Carolina. The total reduction amounts to $934,730. The textile plants were recently placed on a basis of 50 per cent. instead of 60 per cent. as a basis of taxation. This action cut down the assessed value of mills by about $3,000,000.

An interesting case is to be heard at Danville, Va., soon, which will be watched by mill men. The point to be decided is whether or not two large mill corporations can merge to the detriment of the stockholder of the parent company. The Riverside Cotton Mill and the Dan River Power and Mfg. Co., of Danville, effected a merger on August 1st. The capitalization of the combination amounts to $6,500,000, with authority to increase to $10,000,000. The merger was ratified by a large majority of stockholders of both corporations, and officers of the mills contend that it was therefore legal. The complainants contend that the merger is unfair to them, and they further hold that the merger is in violation of both the State and National laws and of the Sherman Anti-Trust law. The suit has been started in Danville.

S. B. Tanner, president of the Henrietta Mills, Caroleen, N. C., in a recent interview on the general situation in the industry said:

"Three years ago we manufactured into goods over 13,000,000 bales of American cotton, which gave the world a surplus of goods, and which has not been consumed even with enforced curtailment brought about by a crop of ten and a quarter million bales. Suppose the last crop had been 14,000,000 bales and had been manufactured into goods, we would have the additional four million bales on top of the present surplus of goods. There is no questioning the fact that the present spindles and looms can produce more goods than the world can consume. I contend that we have too many mills for the reason that we oversupplied the world three years ago and again two years ago just after making the two big crops. Since that time the world has added nearly twenty million spindles. These additional spindles would enable the mills to use say fifteen to sixteen million bales of American cotton or more, of the weights of goods we formerly made and foreign cotton in proportion, and this is considerably more than the world can consume until the cotton goods wearing population materially increases.

"We have been told that the Chinese market was almost unlimited, but I am reliably informed that the Chinese merchants have good which we shipped them from this country three years ago. Mills all over the North and South, which have never curtailed before, are realizing the situation and are not only curtailing weeks and months during the summer, but are planning and are forced to extend at least half of September, something unheard of before in the South, especially.

"We need a moderate crop of cotton this year, say not over 12,500,000 bales in order to enforce curtailment until the world can use a larger crop at a living price for the planter and the manufacturer. A crop of 15,000,000 would cause the mills to increase the surplus stock on account of the low price at which cotton would sell, and goods would sell at a loss on account of the overproduction, as they have been doing whether cotton is 15 or 8 cents. The planters would also have a losing business in consequence.

"The theory that more goods would be consumed if the price of cotton ruled lower is not correct, as staple goods have been selling on a 9 to 10 cent. basis for eight months. The ideal condition for a successful, legitimate cotton manufacturing business would be a staple price for cotton and a moderate crop near the consumptive requirements of the world. This would cause a condition which would make speculators, who cause the extreme fluctuations, afraid to venture too far in buying or selling. Large crops and over production certainly give the consumer low prices, which he is not entitled to, as they are a loss to the producer and the manufacturer."

RAYMOND D. BORDEN, Fall River, Mass., reports a better business in July and August than in 1909, with a better feeling as to prices, which as a matter of fact are distinctly higher than at any time this year.

India supplies over 60 per cent. of China's cotton wants, and Japanese or foreign spinners supply the major portion of the remainder. China itself has only 750,000 spindles in operation in factories.

NEW ENGLAND MILL SITUATION.

(*Special correspondence.*)

The textile industry in the New England States is emerging from the dark, lowery clouds of depression and curtailment that have characterized the situation for over five months, into an atmosphere of cheerfulness, confidence and optimism. That the worst is behind us is unquestioned; that the immediate future is brighter than for many months is generally conceded. September has created fundamental conditions of acute soundness and an undertone of confidence has developed that encourages the most pessimistic.

The end of drastic curtailment is drawing near, because a better demand for goods has developed and buyers seem willing to consider prices based upon a relative value for raw cotton. Western demand appears to have turned the tables, although New York selling houses report a broader demand for fabrics than for many months. Retail shelves are very low on stock, and commission houses frankly admit having extremely low supplies of fabrics on hand. If present curtailment schedules are not modified there will be a continued depletion of surplus stocks during the fall months.

The second week in August developed an improvement in the market for fabrics and during the balance of the month the demand appeared to quicken and the market strengthen under the stimulus of converters buying and a general demand from the retail trade which have been running as close to the wind as possible. Prices remained throughout the month, on a basis of 13 cent cotton while actual spot cotton was quoted at least three cents higher and futures around 14 cents. Crop reports did not encourage consumers to look for lower prices for finished goods; in fact, the bears on cotton fabrics have turned bulls and are covering on fabrics at prevailing prices. Manufacturers are not accepting contracts for future delivery at under a price basis of 15 cents for raw cotton.

Just so long as there is a disparity of from one to three cents per pound between spot and future deliveries of fabrics, in favor of the spot market, the buyers will be conservative and the market will not show a marked degree of activity, such as exists in normal times, until prices of fabrics rise to the level of raw cotton. A few isolated contracts were closed last month for future delivery, to extend until the first of the year at current quotations, by manufacturers that have some low price cotton on hand and are willing to sacrifice to keep their machinery running. A contract for wide drills was closed during the middle of August at a price that will show the mill less than 2 per cent. profit on the entire contract. Deliveries are to extend through the fall months into December. Another contract was placed for wide sheetings with a Fall River mill at a price that will show a substantial loss to the mills unless future options decline at least 10 per cent. before the first of October.

The gingham season has opened up with a rush and there is every indication that the coming Spring will develop greater popularity for the better grades of dress ginghams than for several years. Southern lines have been well taken, in fact, a large New York jobbing house withdrew prices on its line of Southern dress ginghams two days after the opening. Amoskeag and Everett ginghams have taken very well while Bates fabrics have had a splendid run, jobbers report. Production of such fabrics has nearly doubled in the New England States during the last two years and a still further increase will develop as soon

as all of the new looms now contracted for are in operation. The Crompton & Knowles automatic gingham loom has been installed at York Mfg. Co., Boston Mfg. Co., Parkhill Mills and several other gingham mills, during this year, and deliveries are still being made on orders placed one year ago.

The drastic curtailment that has been in operation at Fall River since the first of July has resulted in a material depletion of surplus stock and has greatly improved the print goods market. Salesmen for prints report a very much better demand and indicate strong prospects for improved prices. Converters will have to buy heavily this Fall if they wish to be in a position to take care of their Spring trade. Fall River manufacturers look for a very much better demand for print goods this month and at a recent meeting the opinion was unanimous that higher prices would prevail by the middle of this month. The American Printing Co. will announce new prices this month that will attract buyers to the print market.

The guaranteeing of prices on prominent staples to October has established confidence in such goods and greatly stimulated the demand. The Goddard and Knight goods that were guaranteed in July until September commanded a splendid market during the summer as compared with other lines, and present indications are that further guarantees will be made by these interests. Amoskeag A. C. A. ticking has been put up to 12½ cents per yard with a tacit understanding that this price will hold so long as early deliveries of raw cotton are between 13 and 14 cents per pound. Other brands of tickings are firmer than last month with a very fair market for sized goods under 8 ounces. Awning stripes are extremely dull with prices holding firm. The season on these goods is over. There will be shown a number of specialties for the new season of 1911.

The yarn market has shown a slight improvement during the month but still continues one of the most unsatisfactory departments of the industry. Southern weaving yarns have braced up in price but not in demand. With the drastic curtailment out of the way the yarn market should show a radical improvement, particularly the finer counts of weaving yarns. Spinners are more hopeful than for several months and feel confident that another month will show a decided bracing up in prices and demand. Already two and three cents per pound have been added to July quotations for the finer counts of two ply yarns, and spinners declare they will follow the trend of the raw cotton market despite the demand for yarns.

Exports of cotton fabrics to September were about 20 per cent. less than during the past year, and there is little probability of an improvement in this ratio for the balance of the year. Pepperell drills are being freely sold to the Indian trade at slight advances over lowest prices of the summer; but there is no demand from this country for other lines of American fabrics. The Red Sea trade is very unsatisfactory and inquiries have practically ceased since the general hardening of prices during the early part of August. Chinamen are holding off because of the general unsatisfactory financial condition in that country and also because of the attempt boycott of American goods. It is freely reported that this boycott was instigated by young Chinamen to assist the Japan market. Manila is buying small quantities of special fabrics and some 4.70 sheetings at ⅛ cent advance over July prices. South America is taking sheetings on June contracts and several large shipments of light ducks and tickings were made to Latin America last month. Bliss, Fabyan 's brands of Thorndike and Cordis tickings are popular in Chili and Colombia.

September and October will develop critical moments in the textile industry. A large number of new mills such as the Maverick Mills of East Boston, Mass., with 1,000 looms; Ponemah Mills of Norwich, Conn., with 500 looms; New Bedford Cotton Mills with 1,250 looms; the Nashawenna Mills of New Bedford with 4,000 looms and scores of other new plants will start operation on fabrics that today are being sold for less than the actual cost of raw materials. To be sure, there will be little surplus stock of fabrics, after the long period of curtailment, but if demand should not develop as quickly as interests identified with these mills expect, conditions may be unpleasant.

Builders of textile machinery and manufacturers of textile mill supplies have experienced a very unprofitable season. Large stocks of goods have been accumulated by the supply makers while machinery builders, aside from the large loom builders, have had to scale prices to a very low point in order to secure business. The larger loom builders have been working on orders for delivery to the many new mills that will start operations this Fall, so that they report a very satisfactory market for their wares. The outlook is entirely satisfactory for both machinery and supply manufacturers and unless this country experiences a tremendous agricultural failure, the year 1911 will witness an unprecedented boom in the textile industry. The laws of supply and demand will govern the situation.

Over $18,000,000 of new capital has been voted during the last three months for additions and extensions to New England cotton mills and of this amount 80 per cent. will go directly to builders of textile machinery and manufacturers of textile mill supplies. Four new mills are to be built in New Bedford, three in Fall River and so on throughout the textile centers of this group of States.

The captains of the textile industry are confident of the soundness of conditions and of the probable expansion of this great industry, as evidenced by the frequent announcements of new construction; investors in textile mill shares are confident of the true investment worthy of these securities, as evidenced by the light offerings at public sales and staple prices that are maintained, and financiers see the opportunity for development of this industry and profitable employment of funds by consolidations as evidenced by the several announcements of large underwritings of textile shares by prominent banking interests during the month of August.

Offerings of cotton mill shares have been very light this past month and sales recorded have been at slight recessions from July prices. No doubt the general uncertainty of listed stocks and bonds affected textile shares sympathetically; but the market showed no evidence of turning weak or of liquidation. Stocks are in very strong hands and considering the fact that over $600,000,000 are invested in American textile mills, it is remarkable that there are so few offerings of such securities. Fall River stocks are very quiet with a hardening tendency, while New Bedford shares are positively strong. Hayden, Stone & Co., the underwriters of the Maverick Mills issue, are fully confident that as soon as this mill is in operation, which will be in October, that they will have no difficulty in disposing of the unsold balance of stock which amounts to probably $300,000.

MONTHLY REVIEW OF THE COTTON MARKET.

BY H. & B. BEER, NEW ORLEANS.

The last week in August witnessed the close of the commercial year of 1909-10. The crop was a very small one, the yield per acre the smallest on record, being about 154 pounds. Prices were very remunerative, however, the lowest price of the season, middling, New Orleans, being 12 3/16 last Septemer, or at about opening of the season, having been almost as high as the average price obtained for the 10,011,000 bale crop of the famous Sully year of 1903-04 when the average price for that season was 12 15/16. By the 1st of January of the past season middling cotton in New Orleans had sold at 15¾, and while values reacted thereafter, the lowest level touched for middling cotton during balance of the season was at the opening of June when 14½ cents was reached.

As a matter of fact the cotton planter is now receiving more money for cotton seed, which some years back was used as fuel, than he obtained for his cotton 12 years ago. In other words seed is now bringing about $24 a ton in Texas, and sold as high as $30 a ton during the past year, whereas cotton, about 12 years ago, was selling for 5 cents a pound at the ports, or only $25 a bale. Today cotton is selling at about $75 a bale at the ports, and including the seed for about $100. Such has been the history of the staple during the past year. As for the future, uncertainty prevails. The crop promises to be of moderate proportions, perhaps about 2,000,000 larger than last season's yield, the "in sight" of which, according to the New York Chronicle was 10,583,094 bales on August 26th, and some people have not lost hope in a 13,000,000-bale crop the coming season.

In face of the high prices for farm products, cotton, grain, provisions, etc., the balance of trade is against the United States to the extent of about $66,000,000. There is political unrest throughout the country, and the Fall elections will be a disturbing feature in business circles. The high cost of living has to be reckoned with. The Oriental countries are not in the market for goods owing to the abnormally high prices prevailing, especially for cotton and cotton goods. Therefore, politics and the condition of the masses have to be taken into consideration, and it is a question if the world can go on paying, or rather buying freely of manufactured goods under the circumstances. With the opening of September manipulation of the cotton market will probably have about disappeared. The fight will then narrow down between the farmer and the spinner, trade conditions governing.

As to the progress made by the growing crop during the past month, there has been, on the whole, no important change. In all States except Texas favorable weather has prevailed during the past four weeks, and it is said that there has been a marked improvement in the condition of the plant, especially in the South Atlantic and Mississippi Valley States, which sections suffered so much from excessive rains during June and July, so much so that it was thought the crop could not come back. However, late advices from all districts east of the Mississippi River are to effect that there is a good chance now of making an average crop.

In Texas, dry, hot weather continued throughout the State until about the middle of August, and as the July rainfall for the State only averaged 1.37 inches against 2.40 inches last year and 2.90 inches year before last, making the June-July rainfall total only 3.27 inches for the State compared with 5.77 one year ago and 5.38 in 1908, the crop suffered serious deterioration except in the extreme northern portion of Texas and in the Panhandle section. Of late there has been some rain in the State, particularly in North Texas where good rains were had, but East, South and West Texas only had moderately heavy rains, while Southwest and Central Texas had little or no rain. To give an idea of the cotton crop situation in Texas by districts we quote from the Galveston-Dallas News of date August 23, 1910, showing conditions as reported on August 17th, compared with one year ago, using 100 as a basis for last year:

District	Acreage	Condition	Bales Ginned last year, Census.
East Texas	108.3	99.3	332,876
North Texas	101.5	110.9	504,467
Central Texas	98.9	105.4	774,247
South Texas	99.4	97.6	249,934
Northwest Texas	104.5	119.6	185,584
Middle West Texas	104.7	91.0	269,667
Southwest Texas	109.6	84.8	171,541
Panhandle and West Texas	110.3	137.6	34,495
State of Texas	102.6	102.9	2,522,811
State of Oklahoma	114.2	130.6	544,954

According to the above the crop prospects in South, Southwest, Middle West and East Texas are less favorable than last year when the crop was very poor in sections named. Nevertheless, the Texas crop will probably approximate 3,500,000, the crop outside of Texas about 9,000,000, which would give a total yield for the whole belt of about 12,500,000 bales against about 10,600,000 bales last season.

THE YARN MARKET.

From the spinner's standpoint the yarn market during the month of August may be said to have made considerable progress in bettering the unsatisfactory condition which has existed for many months. Quotations as a rule were advanced during the month on different numbers from one-half cent to one and a half cents, and spinners continued to maintain their position in refusing to accept business below their own quotations. It was mentioned in these columns last month that the position of the spinner was technically strong, and the improvement in the market during August seemed to bear out the prediction that higher prices in yarns would prevail from then on.

Buyers evidently became convinced that they had overstayed the market, and that the supply of stock yarns was smaller than they had allowed themselves to believe, although reports of a small supply of such yarns were freely circulated. From several of the orders received during the month in which the instructions were given for rush deliveries, it was quite evident that the stocks of the buyers were running very low. Spinners realized the fact that the buyers were staying out of the market more on account of a lack of demand for their goods than any supply of yarns that they may have had on hand. So long as the spinner continues to meet this lack of demand by curtailing production he will control the situation, and it appears from the new agreements to continue curtailment operations during September, that his position will be maintained.

Conditions in the market during the first week of the month were little changed from the preceding week, and more or less irregularity prevailed in certain numbers where some stock yarns were available. The advance that had taken place in the market up to that time had made the buyer somewhat skeptical of the market. Although he was willing to talk business on the basis of 12 cent cotton, the spinners were then basing their quotations on 14 cent cotton. The higher range of prices, of course, invited some selling, and taken all together the market showed a better feeling and more business than had been experieneed for a long time. Hosiery and knitting yarns were very quiet during the first week of the month and the impression was that a considerable quantity of stock knitting yarns was being carried.

The extent of the advance was fully appreciated by the spinners during the second week of the month and they seemed to realize that the rapid mounting up of prices had the effect of decreasing the number of orders. As a result quotations were shaded slightly to inducc buying. These slight concessions did not alter the improved position of the spinners which had been gained, but did tend to help activity in the market. An improved demand was noted in the weaving yarn department even with the increases from one half cent to one cent a pound, the general feeling being that higher prices would be asked in the near future. The advance had the effect of eliminating speculation which had been noted during the previous month. The absence of concessions in weaving yarns indicated very clearly that the supplies of stock yarns had been reduced to practically a negligible quantity. Hosiery yarns also showed advances in price at that time, although the business put through seemed to indicate that the buyers had covered their requirements very generally at lower prices.

It was quite evident throughout the month that buyers were seeking to avoid paying the advanced prices named by spinners, and considerable shopping around the district was done in an endeavor to pick up small lots at concessions wherever possible.

Another factor which seems to have aided in maintaining the advanced prices was the fact that spinners were not buying raw stock for future deliveries, and they could not accept contracts for yarns with any certainty that they could come out whole.

While business was not what might be termed active during the latter part of the month, yet increasing interest was manifested and the tendency of prices was upwardly.

FABRICS FROM NETTLE FIBER.

A Vienna firm, Kriessel & Siebert, has apparently succeeded in obtaining from nettles a snow-white pliant bulk of fiber, with merits half way between those of cotton and linen, with the further great merit that it should be cheaper than either because of the limitless quantity of nettles that can be grown, with slight encouragement, in many regions. Fabric made of nettle fiber is nothing new—indeed it is stated that formerly housewives made their best sheets out of it—but hitherto no way has been found of separating the valuable fiber from the accompanying gums and waste, on a commercial scale. It is said that the Austrian government is undertaking the supervision of investigations and experiments on a decisive scale.

THE KNIT GOODS MARKET.

Probably the most interesting news to chronicle in any market is a turn for the better, and at least in the knit goods division it indicates that business is improving for the mills and also that the jobbers must be moving their stocks when it becomes necessary for them to replenish their lines. This sudden change for the better in the knit goods department arrived near the end of the month and it is needless to say that it was welcomed on all sides as any improvement over the trying situation which has existed in the market for such a long time and was most welcome to many a manufacturer who had grown disheartened at the lack of business and with poor prices.

The first week of the month found little change in a situation from the preceding month, and the lack of any better prospect in the near future caused some of the small manufacturers to consider unloading some of their stocks which had accumulated. This was especially true in cases of undesirable patterns which would not well stand being held over for another season. Other manufacturers who were in a financial position to do so made advances on their goods from two and a half to five cents. This was considered a wise step in view of the prevailing high prices of yarns and the prospect that such prices would be maintained if not advanced. The improved demand began to be slightly apparent during the early part of the month both in prices and amount of sales. As regrads the popularity of color, the slate continued to claim especial attention with brown and black continuing in popularity and surpassing other shades. Mercerized black was also popular as was also silk hosiery, the demand for sheer hosiery having continued very pronounced.

Quiet improvement characterized the market during the middle of the month, and duplicate orders being more in evidence than for some time. Some orders for Spring were received but the season for the advance business was practically closed. The mills claim that the business contracted for, for the Spring season was very small and without profit, as the prices were on a parity with last year's quotations, even in the face of higher priced yarns which will have to be used in the production of the goods. The opinion was general during the middle of the month that prices would rise shortly, and a great many of the manufacturers had urged their agents to raise the prices as soon as conditions allowed.

It was pointed out some time ago that the buyers in delaying making contracts would find themselves unable to get deliveries as they desired later on, and this difficulty began to make its appearance last month when the jobbers began to have more or less trouble to secure their deliveries as soon as they desired them. In excusing the situation, the mills claimed that the jobbers should have placed the orders sooner, and the jobbers in turn laid the blame on the retailers whom they claim were backward in giving their orders.

The improvement in the market continued slowly until the last week in the month when more activity was manifested than for a long time, and the turning point for the better is now said to have been passed. The new demand was not confined to a few lines, but all classes of products were included in the general activity.

COTTON MANUFACTURING.

BLENDING OF COTTON AND WOOL.

THE EVOLUTION OF THE CARDING ENGINE. DESCRIPTION OF ARKWRIGHT'S INVENTION. EARLY TYPES OF SCRIBBLERS. DIFFERENT DESIGNS TO SUIT THE VARIOUS WOOLEN PRODUCTS.

(*Contributed exclusively to* COTTON.)

BY JOSEPH H. BARKER.

PART VI.

THE EVOLUTION OF THE CARDING ENGINE.

Reference has been made in a previous article to the size and the number of parts of various kinds of scribblers and carding engines, and to the most suitable speeds at which the machines should be run. Opinions vary very much on this subject; the manufacturers of one class of goods advocate broad machines with many parts and relatively low speeds, while the manufacturers of another and quite different class of goods advocate narrow machines, with only one swift, and high speed. Both have equally good reasons for the opinions which they hold, but neither could sucessfully do the work of the other, upon the machinery and at the speeds which experience has taught him is most suitable for the kind of material which he is engaged upon.

There was a period in the history of woolen manufacture when the scribbling and carding machinery was of approximately uniform in character and construction, and fortunately for the discussion of this subject there are a few old manufacturers still living (upon whose evidence reliance may be placed) who remember the time when but little change had taken place in either one direction or the other, and with the aid of their experience, and by reference to the specimens of the earliest carding engines which have been preserved, it is possible to trace the sequence of some of the changes which have taken place in the form and size of scribblers and carding engines, and also the reasons, to some extent at least, for those changes.

The evolution of the carding engine has proceeded but slowly, and has engaged the attention of manufacturers of both wool and cotton for about a century and a half. The earliest carding engines of which specimens have been preserved are those built by Arkwright in 1771. These were regarded as an improvement upon the roller cards which were invented by Lewis Paul about a decade earlier, and embodied the essential principles of the modern cotton carding engine. Some of these machines are now in the possession of Platt Brothers & Co., of Oldham, England, and by their permission we are enabled to give illustrations of them as shown in Figs. 10 and 11. They were exhibited at "The Old Leed's Exhibition," along with many other primitive appliances of the woolen trade, and the following description of them is taken from the catalog of the exhibits:

"These carding engines, although constructed primarily for the manufacture of cotton, were subsequent to the invention of a roller carding machine by Lewis Paul in 1738, used for all sorts of wool or cotton which it is necessary to card." The breaker and clearer carding engines as improved by Arkwright although very rude in construction, possessed the essential motions of modern machines. They serve to illustrate in a forcible manner how imperfect was the machinery used for a considerable period after the mechanical principles had been devised.

The method of doffing the material by means of a doffing comb, and of differentiating the speeds of the feed and delivery parts exists in these machines, and the modern machines, whether for wool or cotton, are the same in principle of action and control.

Before the invention of the roller-card machines, wool was carded as well as combed by hand. This is still done by the cottagers of Scotland and Ireland. In this way a few pounds of material may be treated per day, whereas on the modern carding machine the output per day may vary from 280 to 800 pounds.

At that time the motive power for driving machinery was horses, some machines even being turned by hand. The steam engine had not yet been applied to the purpose of driving revolving machinery, but was used mainly for pumping purposes. The reciprocating motion had not yet developed into the rotary. Steam was admitted into only

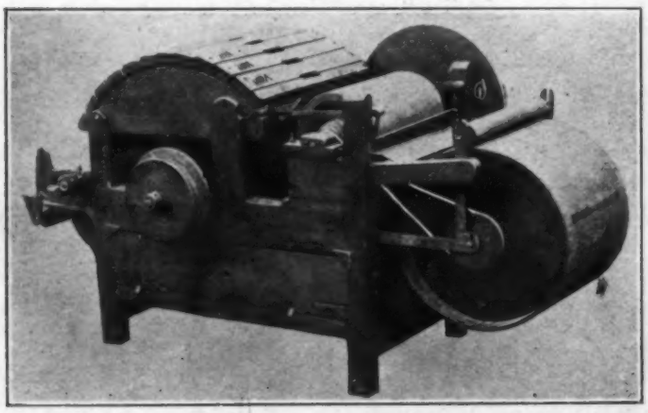


FIG. 10. ARKWRIGHT'S BREAKER CARD. MADE IN 1771.

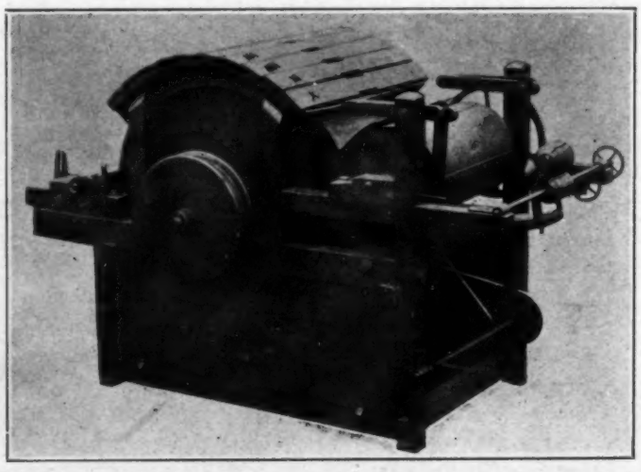


FIG. 11. ARKWRIGHT'S CLEARER CARD. MADE IN 1771.

on one side of the piston, the other end of the cylinder being open to the air, the return stroke of the piston being effected by the pressure of the atmosphere, and the valves were operated by hand.

Previous to the improvements in the steam engine, which made it available for driving revolving machinery, the motive power for driving mills and machinery was the old-fashioned horse-gin, which was worked by one or more horses, according to the size of the mill and the quantity and size of the machinery. The machines were necessarily small in size, for the reason that one or two sets of machines was as much as two horses could conveniently drive at a uniform and constant speed. The earliest machines generally consisted of one swift, and were as a rule, about 24 inches wide.

With the application of steam as the motive power, it became practicable to build not only the mills, but the machinery also on a larger scale. Scribblers of 40 inches width and even of 48 inches on the wire soon became common, and in course of time they were also enlarged by adding a second swift. This was the type of machine in general use in Yorkshire, England, in the early years of the nineteenth century, and in some branches of the trade it is still the approved form; the width, meantime, having been increased to 60 inches.

The West of England manufacturers, however, still adhered to the single scribblers of 40 inches on the wire, that form of machine being according to their experience and judgment best adapted for carding the Silesian wool which was used, and for producing the kind of thread which was required in manufacturing the description of cloth for which that district was so famous. They found that a softer, more woolly and plushier thread could be formed by the use of several single scribblers and frequent crossings combined with several drawings in the spinning process, than could be formed by the Yorkshire method.

The threads were required to be small, and of the most perfect regularity in thickness and twist. Experience had taught them that such a thread could best be produced by the use of single scribblers and carders.

It was known that when scribblers, and carders with two or more swifts of 60 inches in width were used there was a marked tendency for the wool to gather, and the load of wool would become thicker in the middle (laterally) of the machine, and proportionately thinner at the edges or sides. This condition was due partly to the action of the fancies, which almost invariably throw out some of the lighter wool in the form of fly, which is carried forward by the current of air generated by the rapid motion of the revolving cylinders, and which fly concentrates in the center line of the machines. Some of this fly again settles into the machine, and some of it settles upon shafting, piping, or other objects, which are placed above the machine.

A further element in the production of this kind of irregularity, is the operation of the natural law of centripetal force, in accordance with which the wool necessarily and gradually converges to a center, in this case it is the center of the machine. The longer the machine, and the more fancies there are, the greater is the concentration of wool in the center of the machine. In the case of the scribbler this is not so objectionable as it is in the carding engine. In the scribbler it results in irregular work and the separation of the longer fiber from the shorter. The condition is, however, rectified by the cross-feeder.

In the carding engine, if it be a long one, the same conditions arise, with the result that the middle slivers of the condenser are thicker than the edge slivers; and threads irregular in thickness and consistency are produced. All these conditions are the more noticeable when the wool is fine and light.

These conditions indicate the desirability of using single machines for fine all wool goods, in which threads of perfect regularity in thickness are necessary, and for that reason the west of England manufacturers continued to use, and develop the single machine. Further, it was found that narrow single machines could be run at a high speed, and thus turn out almost the same quantity of work as the longer and slower machines; and without any marked centripetal concentration.

Those manufacturers who were engaged in the manufacture of low goods, in which mungo and shoddy were the principal ingredients had to deal with short and generally, not very strong fibers, and their efforts were directed to arranging the fibers in such a way as to obtain the greatest possible length from them, and to prevent the breaking of the fibers by rough or harsh treatment. To that end crossing was avoided as far as possible, and the longitudinal arrangement of the fibers was aimed at.

The long scribbler with many parts was thus gradually evolved, in which the filaments were preserved in the longitudinal position, and only one crossing took place, namely, that which takes place in feeding to the carding engine. That crossing was effected in such a manner as to disturb as little as possible the parallelism of the filaments. At first the machines were built with large swifts, 50 to 52 inches in diameter with 4 or 5 workers on each swift, and were run at about 1,000 feet per minute, surface speed. It was observed, however, that such high speed and so many workers were injurious to the fiber, and the speed was therefore reduced from time to time. After the reduction in the surface speed, the difference in the thickness of the middle and the edge threads of the condenser was not so great.

The surface speed was then further reduced by decreasing the size of the swifts to 40 and 42 inches diameter, and the number of workers was reduced to three, and in some cases to two. The length and strength of the material was much better preserved thereby and the operation of the law of centripetal force was not so conspicuous, and the fancies did not "throw" so much. Then experiments were made with broader machines 84 inches in width in the belief that what had been sacrificed in speed, might be regained in width. The result was satisfactory.

Other changes and adaptations were made for the purpose of more successfully scribbling mungo and other short and tender fiber, without injuring or making it still shorter. The doffers were made much larger, and were run at a higher speed, for the purpose of getting the work through the machine more quickly and with less injury to the fiber. Thus through these and numerous other changes and improvements, the single swift carding engine of Arkwright has been developed into the ponderous four-swift scribbler of the Morley and Batley trade, which is the extreme form of broad, long, scribbler of many parts and slow surface speed.

The two descriptions of scribblers which have been mentioned serve to indicate the extreme limits of the evolution of scribbling and carding machinery. There are, how-

ever, other branches of wool manufacture in which neither of these extremes forms can be said to be the most suitable, and we find scribblers in general use, consisting in some cases of two and in other cases of three swifts of 50 or 52 inches in diameter, and with 3 or 4 workers mounted over each swift. Such machines are used mainly for blends consisting principally of wool, and are run at speeds varying from 60 to 80 revolutions per minute, the speed being always adjusted to the kind of material to be operated.

Woolen manufacturers have to manipulate the finest and silkiest wool which the world produces, and also the coarsest and dirtiest. Wool which they receive will sometimes consist of 25 to 30 per cent. of wool fiber and 70 to 75 per cent. of grease and dirt. Some have to scribble mungo, shoddy, and numerous other kinds of waste, and even hair, some of which can best be described as "muck," and they have also to operate these, or some of them, in combination with cotton and china-grass. Some manufacturers produce yarns so small and fine, as to measure 120 yards or more to the dram, and others produce yarns of 3 yards or less to the dram. Thus material has to be scribbled which is so short and tender in the fiber, that the threads will scarcely bear their own weight, and also wool which is long, coarse, and strong. It naturally became a matter of necessity to invent and adapt scribbling machinery to meet these various requirements.

Necessity, therefore, has led to the evolution of the modern scribbler and carding engine from Paul's and Arkwright's very primitive and rude machines, and it is quite possible that we shall yet see many changes and improvements in them. Many fanciful ideas and notions have from time to time been introduced into scribbling machinery, which were intended to make them do two, three, or four times as much work as other machines; but few of them have survived the test of practical use.

(To be continued.)

THE LEADING GROWTHS OF COTTON.

PRINCIPAL VARIETIES OF THE WORLD—CHARACTERISTICS OF THE COTTON FIBER—FULL GRADES OF COTTON—MOISTURE IN COTTON.

(Contributed exclusively to COTTON.)

BY WM. H. DOOLEY.

(Continued from July.)

Cotton is likely to be injured by too long exposure to the sun without moisture, or by heavy rains, and also by the winds, which load it with dust. The cotton pod is loaded with oil, and should heavy rains come after the pods are about half open, the cotton becomes boll stained, or what is commercially known as "tinged" cotton. A long dry season generally signifies weak, short and irregular fiber. A very wet season means an abundance of leaf and a small crop. The cotton plant blooms ten or eleven weeks after maturity, and early bloom is taken as a sign of good crops.

The fiber is not round, as is generally supposed, but is spiral in form and tapers off, the thick end being that nearest the seed. Unripe cotton, instead of being spiral, is flat, and will not readily twist with other fibers, consequently it causes weak and irregular yarn. Cotton fiber, as seen under the microscope, has the appearance of a twisted ribbon with corded edges. During growth it is a hollow, cylindrical tube, containing the vital liquid of the plant; but when maturity arrives the tube becomes empty, the pressure of the atmosphere causes the fiber to collapse at the point, and as it dries it begins to turn on its own axis. The corded edges are formed by the bending of the walls of the fiber on themselves, thus causing what is generally termed the natural twist of the fiber. In the process of working, the natural twist and corded edges of the fiber are found to be of considerable importance in the twisting process, as they become firmly bound together by the folding over and the gripping of the corded edges of one with the other, thereby enabling a continuous thread to be produced.

Unripe fiber, being destitute of these qualities, does not hold together as well, hence the yarn made from unripe cotton is weak. The distinguishing characteristics of unripe cotton are the number and irregularity of the natural twist; it is weak and flat, and does not bleach or dye as well. Pods which are only half ripe are often forced open, and the fiber sent on with the good cotton. East Indian cotton is more highly charged with unripe cotton than American cotton.

In working the fiber it is most subject to injury by over beating at the picker machine and over drawing. Pressure in baling does not injure the fiber, except by crushing the seed and consequently staining the cotton. Some cottons have quite a greasy smell, this greasiness being also manifest to the touch. Egyptian cotton is sometimes so charged with grease that to make it workable it has been necessary to sprinkle it with whitening. It has been observed that velvets made with Egyptian cotton filling do no finish as well as when woven with yarns made from American cotton, the reason for this being that the greasy nature of the Egyptian cotton fiber often varies in strength, one part as compared with another, causing different shades in the finished goods. This greasy nature is said to be due to two things: first, the fertility of the soil; second, the extent to which the cell walls of the fibers are developed.

The method of the manufacturer in buying cotton is to purchase from a cotton broker, samples being furnished to the buyer from which to make a selection. The terms of purchase include an allowance of 4 per cent. for tare; that is, a bale of cotton weighing 400 pounds would be paid for as 384 pounds; or, should the buyer have reason to believe that the tare is unusually heavy, he has the option of claiming the actual tare. This is ascertained by stripping 10 bales and weighing the covering and the hoops, which would mean considerable work, and although it is at the option of the buyer, it is an exception rather than the rule. In paying for a purchase the buyer may pay cash, receiving a discount at the rate of 5 per cent. per annum, or, if the term of payment is extended, the same rate is charged for interest.

FULL GRADES OF COTTON.

Egyptian cotton is classed under three grades: fair, good fair, and good.

Indian cottons have four grades: fair, good fair, good, and fine.

Brazilian cotton has three grades: middling fair, fair, and good fair.

American cotton has seven full grades: ordinary, good ordinary, low middling, middling, gobd middling, middling fair, and fair.

In addition to the full grades there are half and quarter grades as follows:

Half grades: Strict middling fair, strict good middling, strict middling, strict low middling, strict good ordinary, and strict ordinary. Quarter grades: Barely fair, fully middling fair, barely middling fair, fully good middling, barely good middling, fully middling, barely middling, barely low middling, fully good ordinary, and barely good ordinary.

The commercial value of a cotton is determined by its length, fineness, strength, pliability, smoothness, regularity, color, and cleanliness. As a rule the cotton that is the longest is also the finest, but by no means the strongest. Thus, Sea Island cotton has the longest staple with the least diameter, and Hingunghat (an Indian cotton) is much inferior to it in both respects. The strength of the latter, however, is 50 per cent. greater than the strength of Sea Island cotton. In every other respect Sea Island cotton is superior to Hingunghat cotton. It is the most valuable, especially for the production of fine yarns. The most regular cotton is Orleans, in which the length of the staple varies only a small fraction of an inch. In consequence of this there is less loss in working Orleans than is the case with the other cottons, owing to the fact that their fibers vary in length. When the carding and drawing processes are dealt with later on, the importance of regularity and uniformity will be seen very clearly.

Cleanliness is an important factor in buying cotton, because the impurities add so much to its weight as purchased, that their removal involves a serious charge to the mill owners. This defect is a great drawback to the use of Indian cotton, as the waste at the picker process becomes greatly increased if, through carelessness, the quantity of sand and dirt is increased. In all cotton there are more or less unripe and short fibers, which it is impossible to avoid altogether, as they are found in pods which to all appearances are quite ripe and ready for picking.

During the last few years considerable discussion has taken place among mill men, both in this country and abroad, bearing upon the subject of moisture contained in baled cotton. Of course the natural moisture in the cotton fiber varies, as might be expected, from year to year, according to the character of the season during the picking. However, it has been hinted that the amount of moisture in some instances is added willfully. The average moisture in most cotton is about 2 per cent., although it has been known to contain as high as 5 per cent.

The following are a few of the leading varieties of cotton, with the numbers of yarn they will make:

Cotton	Length	Warp	Filling
Sea-island (selected)	1¾ to 2¼	up to 200	250 to 300
Sea-island (ordinary)	1¾ to 2	150	220
Florida Sea-island	1¾ to 2	150	220
Georgia	1⅛ to 1 7-8	120	180
Egyptian	1¾ to 1⅛	70	120
Peeler	1¾ to 1 3-8	50	70
Orleans or Gulf cotton	1 1-16 to 1¼	40	60
Upland	1 to 1 1-8	30	45
Texas	7-8 to 1 1-16	25	35

Raw wool contains only 50 to 70 per cent. of pure fiber, Combed wool contains 70 to 80 per cent. of pure fiber and absorbs 16 to 20 per cent. of moisture.

The wool fiber is very hygrometric, and is capable of absorbing from 8 to 50 per cent. of moisture, according to the state of the atmosphere.

PREPARATION OF COTTON STANDARD SAMPLES.

(*Contributed exclusively to* COTTON.)

BY WM. M. CONRAD.

The experts of the Department of Agriculture were busy until September 1, their efforts having been decidedly strenuous in making up sets of the standard cotton samples to be sent out to the trade. It is needless to say that everyone interested in cotton knows of the adoption of the cotton standards by Congress, but not everyone knows the character of the work in preparing the samples. The interest of Congress, too, is not often aroused in any project to the extent of voluntarily furnishing money to carry the work forward. Yet that was what Congress did this year. There was no money provided in the estimates for continuing the work of cotton standardizing, but the House and Senate added $30,000 to the Agricultural appropriation bill after it reached the Capitol.

The names of the men who served on the standardizing committee are familiar to everyone actively connected with the cotton trade, but in view of the prominence of these men in the cotton world they may be recapitulated: Joseph A. Airy of the firm of John M. Parker & Co., New Orleans. They are both dealers and growers. They are considered the largest cotton growers in the South, which of course means the largest in the world; James Akers, of Inman, Akers & Inman, Atlanta, Ga. He is the treasurer of the Georgia Polytechnic Institute. The firm is one of cotton dealers and is one of the large group of exporters in America; F. M. Crump, of Crump & Co., Memphis, Tenn., is a dealer in all kinds of cotton, but the firm makes a specialty of the higher grades, upon which they are considered authorities all over the country; C. P. Baker, treasurer of the Lawrence Mfg. Co., Boston, Mass., was for many years a Southern cotton dealer; Lewis W. Parker, of the Olympia Cotton Mills at Columbia, S. C., is the treasurer of seven Southern mills, and in that way holds an especially responsible position in the cotton trade. Another member of the committee is John Martin, of Paris, Texas, a grower's representative and formerly a dealer. Other members of the committee are Nathaniel Thayer, of Barry, Thayer & Co., Boston, Mass., chairman of the standardizing committee and also chairman of the progress committee which is trying to turn Boston, his home city, into an ideal civic community. George W. Neville, of Weld & Neville, New York City, is probably one of the largest cotton dealers in this country, while Charles A. Vedder, of John D. Rogers & Co., Galveston, Tex., is a member of the largest exporting firm in the Lone Star State, and as Texas raises one-third of the cotton crop in the United States, that fixes his position in the general cotton trade of the world. The expert classifiers were J. R. Taylor, Dallas, Texas; Jules Mazerat, New Orleans; and W. P. Barbot, New York City.

The members of this committee gave their services to the Department free, and were in Washington over a week before the nine grades were standardized to their complete satisfaction. One of the members of the committee receives a salary of $40,000 a year, and all of them are very highly paid men, so that their contribution of a week's time to the service of the Government was a gift of no small value.

What the committee did was to establish nine standard grades of the staple. They run from strict good ordinary to middling fair. The trade recognizes gradations between each of the Government grades and three higher and three lower at each end of the line. The standards apply only to American white cotton and do not take account of colored, tinted, or Egyptian cotton or any other variations.

The main point is that a standard has been established for a grade and for the first time standard samples have been put up so that, it is believed, they will remain typical. This was the hardest work that the Department had to overcome. Of course weather, light, and dust make a cotton sample deteriorate, no matter how carefully it is chosen in the first place. The representative of the Department, Dr. N. A. Cobb finally devised a scheme of having the samples put into glass tubes, the air exhausted and the tubes sealed like big incandescent lamp globes. Tubes 15 inches long and 2 inches in diameter were treated in this way at one of the big electric lamp factories.

not change shape and crowd each other. The cartons are fastened to the bottom so that they will not shift or spill out even if the sample box is turned upside down.

As a check for any substitution by accident or design there is a photograph of the sample lot placed inside the cover showing each speck of dirt and waste. There is no law at present against tampering with the standard samples, but the photograph would have to be altered if the samples of cotton were touched. Therefore, there is the signature of the Secretary of Agriculture on one corner of the photograph and a print of the great seal of the Department with a certificate stating that this is a photograph of the samples as they left the Department. Now if this photograph were altered it would mean altering a Government document, and that is a penitentiary offense.

These sets of nine sample boxes are put up by expert graders in the Department, but before they are sent out to be used in the trade they are inspected and O. K.'d by a special committee consisting of W. P. Barbot of the

MEMBERS OF THE COTTON STANDARD GRADES COMMITTEE AND THE EXPERT CLASSIFIERS.
TOP ROW, READING FROM LEFT TO RIGHT.—J. R. TAYLOR, W. P. BARBOT, AND C. P. BAKER.
MIDDLE ROW.—LEWIS W. PARKER, F. M. CRUMP, J. S. AKERS, AND JULES MAZERAT.
BOTTOM ROW.—J. A. AIREY, C. A. VEDDER, G. W. NEVILLE, N. N. THAYER, AND JOHN MARTIN.

This makes a set of samples that have been kept for two years without showing any signs of deteriorating. The samples are put in a rack and locked in the dark. They are like the standard yard or the standard meter that every country has to verify all other measures by. They are seldom brought into the light, and then only to compare the standards with the working standards from which standard sample boxes are made up. These standards that are sent out to the cotton buyers are made up in sets, of nine heavy black cardboard boxes. Each of these boxes is 20x20 inches and is filled with 12 pasteboard cartons that are screwed securely to the bottom. Each of these cartons is filled with an identical sample of cotton such as the box is to stand for. The reason that the area of the box is broken up into these 12 sections is to show 12 different styles of cotton belonging to that grade. The cotton is packed in separate cartons so that the samples will

Classification committee of the New York Cotton Exchange, and Jules Mazerat, chairman of the Classification committee of the New Orleans Cotton Exchange. These sets of samples cost the purchasers $35.00 each, and with good care they will last a year or more. If the buyer has any reason to suspect deterioration in his samples he can send them to Washington and have them compared.

The New Orleans Exchange has already taken official action in adopting the Department's standard samples, and members of the Memphis Exchange have fully approved and will probably take official action shortly. Of course it takes the eye of an artist to detect the slight variations of color in the different grades. The department is taking precaution to standardize even the light conditions under which the samples are matched. There is a small grating put overhead so that the eye of the expert is about 12 feet from the cotton boxes and the angle at which the

two boxes are viewed is correspondingly decreased. The room is painted dead white inside and the light all comes from overhead through skylights of uniform size and arrangement, so that there are no appreciable shadows on the sample boxes. It has been found that the presence of a red or yellow building close to the judging room will affect the light so as to render judgment of tinted cottons uncertain, and care has been taken to eliminate these disturbing factors so far as possible.

It was intended that Europe should be represented on the committee that established the cotton standards. This was regarded as important because one-third of the American cotton crop is sold abroad, and if there is any dispute and arbitration after the sales here are made they are finally adjusted abroad and by European standards. Thus it was very desirable to have a universal standard and it is thought by the American growers that this will come in time.

The Department of Agriculture carefully canvassed the names of cotton authorities abroad and three representatives were actually selected from France, England, and Germany, and they agreed to serve on the committee, but it was necessary at the last moment to rush the work owing to the approaching close of the fiscal year, so that the foreign delegates could not attend at the date set for the meeting. The Department had samples of the foreign grades to work with, however, and an effort was made to have the American standards conform to them closely enough for trade purposes. Some of the English buyers are the only ones who have seen the sealed samples so far, and they are personally satisfied with the higher grades, but they say that the lower grades do not altogether conform with their ideas. However, it means a great deal to the American trade to have absolutely permanent standards and to know how they are regarded abroad. It is possible in the future that there may be an international conference and that a set of standards may be adopted that will be officially accepted over the whole cotton using world.

HANDLING A COLORED GOODS ORDER.

DIFFERENT SYSTEMS EMPLOYED—RAW STOCK DYEING—CHAIN DYEING FOR WARP AND FILLING—LONG CHAIN WARPS AND RAW STOCK DYEING FOR FILLING—A PRACTICAL EXAMPLE.

(*Contributed exclusively to* COTTON.)

BY WILL NELSON.

Colored cotton work may be divided into three distinct kinds or systems, namely, raw stock dyeing, yarn dyeing, which involves two distinct methods, known as long and short chain dyeing and beaming, and piece dyeing.

RAW STOCK DYEING. Great care must be exercised when this method is used. Sufficient raw cotton must be dyed in a batch to cover a given amount of yarn, the amount being determined by the size of the mill and orders, for this reason: It is almost impossible and some persons say it is impossible to make two batches of equal shade; and unless the yarn in the same warp and the filling which is used, be of the same shade, streaky, shady cloth is the result. The best of care may be exercised in all the processes, yet mixed batches, even to the extent of a very few threads and occasional filling, will depreciate the value.

Suppose a 50 per cent. mix has to be made of black and white. This can be accomplished by putting alternate laps on the intermediate and finisher, or before the cotton is put into the picker; the latter is preferable because equal weights of both colors can certainly be mixed here, but, if the mixing is made at the lap a 40 or 50 yard lap of black is heavier than the same length of white lap, and this must be allowed for.

When solid colors are being run through, each batch must be watched through to the cloth, and a check system is practised in most mills, that is, a card or check with the words "New Lot" printed on it is attached to each batch, and in this way the carder and spinner can take care of each lot with little fear of the roving or yarn getting mixed. A sample color is also given to each overseer so that the new lots may be compared, and off shades rejected.

As already stated, the batches must be kept separate, and each one must do his part in the work, for it can readily be seen that two strands of roving of two slightly different shades on the intermediate frame will literally spoil the roving for the fine frame. The same is true on the fine frame and on the spinning frame if double roving is used. In spinning, exceptional care must be used, for tight and loose threads cause the yarn to have a different shade, owing to the different amounts of twist in the yarn.

Raw stock dyeing is almost always resorted to for filling yarn.

When the mill is on chain dyeing, there are two methods or systems that may be followed.

CHAIN DYEING FOR WARP AND FILLING.

With such a system it is all white spinning, that is, no raw stock is dyed. Possibly this is the better method for small mills and for small orders. Generally speaking, small mills have no surplus machinery, and it is impossible to run a large number of different colors under such conditions without making more waste than where there is some surplus machinery, besides, the cost is more on account of the increased cleaning and stripping, and there is a greater possibility of specks.

PROCESS OF THE CHAIN: From the spools the yarn is transferred into the form of a ball warp. The number of ends in the ball being determined by the number of ends of each color required. Several small chains are then run together, thus reducing the cost of dyeing. Some mills run chains with a large number of ends in them and split the chains to the number of ends required after dyeing. We believe the first to be the better method, because the ends are more readily separated. To make the small chains, all that is necessary is to have the traverse on the ball warper made in two, three or four sections.

The short chain system of making warps is generally followed in this method, and that means the warp is sized whilst in chain form then run onto the loom beam. The warps are made about 1,000 yards in length with a leese at each 500 yard length, taken to the dye house and dyed or bleached according to the order; then sized, after which a number of chains are linked together and dried on the drying machine. The chains are afterwards split and the number of ends of each color are placed behind the beamer and transferred to the loom beam.

The yarn for filling in chain form is transferred by means of a quiller to the shuttle quill; from 300 to 400

bobbins being quilled at once. With this system there is no colored stock whatever run through the spinning frames.

LONG CHAIN WARPS AND RAW STOCK DYEING FOR FILLING.

In this second system there is no difference in the making of long chains up to the balling machine except that the chains are longer, being about 8,000 or 10,000 yards in length. A leese is put in the chain every 500 yards, and in many mills double leeses are put in every 1,000 yards. The double leese is to allow the long chain warp to be cut into smaller warps if required. Even lengths are not always run, for an order may demand warps of 8,500, 9,000, or 10,500 yards in length, but this is governed by facility and orders.

As before stated, the number of ends in a chain is governed by the system followed, facilities, and ends required in the pattern. For example:

Before placing an order in the mill proper, it is, of course, necessary to have the pattern, number of pieces, and other data incident with the production of cloth. As most all mills have a different system it would be impossible to detail them all. The following is an example of a mill using the chain system throughout for warp and filling:

ORDER NO. 506. DATE, September 10, 1910.

SHIP TO: Coakly & Co., Krongew, N. Y.
PIECES: 12,000. LENGTH, 80 yards.
PATTERN: No. 2,060-B.
SHIPMENT: To commence one month from date.
AMOUNT: 500 pieces each week.
REMARKS: Single fold, must have good selvages, fast colors, yardage to be as near as possible to the stated length.

Pattern No. 2060.

REED, 30/2. WIDTH IN REED, 34 inches.
Finished width of cloth, 32 inches.
WARP, 28's. FILLING, 30's. PICKS, 68. WEIGHT, 5.50 yards per pound.
ARRANGEMENT OF PATTERN: 38 white, 16 pink, 24 green, 16 black, 24 green, 16 pink, 36 white.

COLOR: ENDS IN ONE PATTERN.		NO. OF PATTERNS.	TOTAL.
White	74 ×	12	= 888
Pink	32 ×	12	= 384
Green	48 ×	12	= 576
Black	16 ×	12	= 192
			2040

When the pattern is joined together it will show a white stripe of 37 dents or 74 ends.

A better idea of the actual looks of the cloth can be obtained by using colored crayons and marking the stripes.

It will sometimes happen that a half pattern will be left over. To put in the half pattern will make one selvage different from the other, which is not desirable in high grade goods; so the simplest and easiest way out of the difficulty is to use a whole number of patterns. A lower number of patterns will increase and a higher number will decrease the stripes. This method could be followed to any extent one cares to go, and whether fancy or plain cloth is being considered.

Another point that must be considered in the formation of a pattern is that a cloth made with the broadest-colored stripe near the selvage does not always look or sell the best, for some colors spoil the looks of the cloth if in broad stripes near the selvage; red for instance is seldom used in that way, but when about two inches from the selvage and blending colors between, the value of the cloth is increased, although the actual structure is the same.

As explained, the chains for warp may be made in several ways, and if a sectional baller is used the following could be the division.

Total ends of each color:
White 888 — 2 chains of 444 ends.
Pink 384 — 1 chain of 384 ends.
Nile green 576 — 2 chains of 288 ends.
Black 192 — a chain of 384, and made half the length of the others in the ultimate quantity and split for each warp, or it can be made in a small chain and two, three, or four on the section baller according to the number of ends the creel will hold.

As the mill spins gray yarn only, it is not absolutely necessary to give an order to the carder and spinner for a certain amount of yarn of a certain color, especially if the yarn are standard with the mill, and herein is the saving for small concerns, yea, and for large concerns. We know of a standard gingham mill that accumulated various quantities of yarns of various colors to the extent of many thousands of dollars; this yarn was in different forms and process such as chains, on back beams, in cheeses, and whilst there is naturally a little waste, the above is extravagant. The material sold for waste. If the readers of this article had seen that waste of yarn, almost certainly they would have been converted to the sectional baller and chain system throughout.

If necessary to give an order for a certain amount of yarn of different colors so as to save from waste as much as possible, it is absolutely necessary to know how to figure the amount of warp and filling there is in the cloth.

To find weight of warp in one yard:

$$\frac{2040 \times 16}{840 \times 28} = 1.39\text{-ozs. in 1 yard.}$$

In the above example 2040 equals ends in warp; 16 equals ounces in one pound; 840 equals one hank, and 28 equals the yarn number.

If the cloth is to have a good feel to be obtained by starch, about 5 per cent. would be added to the above to find the weight of warp in the finished cloth.

1.39 + 5 per cent. = 1.45 ozs. per yard.

To find the weight of filling in one yard.

$$\frac{34 \times 68 \times 16}{840 \times 30} = 1.47\text{-ozs. per yard.}$$

In the above example 34 is the width in the reed; 68 is the picks per inch; 16 the ounces in one pound; 840 the yards in a hank, and 30 the yarn number.

1.45 ozs. of warp.
1.47 ozs. of filling.

2.92 ozs. in one yard of cloth.
16 ÷ 2.92 = 5.47 yards per pound.

The small difference between the required weight and the calculated weight will in all probability be taken care of in the slashing and subsequent weaving.

It is sometimes necessary to know the average counts to help in forming judgment on what counts of yarn to use in the making of cloth.

TO FIND AVERAGE COUNT.: Add the sley and pick and multiply by the width and yards per pounds. Divide by 840 and allow a percentage for contraction in weaving and size. The percentage is a variable quantity, only to be determined by actual knowledge of the cloth and conditions you work under, but if the sum of the 4 items were divided by 760 instead of 840 on coarse counts the result would be very close to actual practise in the majority of cases.

$$\frac{(60 + 68) \times 32 \times 5.5}{760} = 29.6 \text{ average counts.}$$

When calculating for the amount of yarn to go in the cloth, the percentage added for size would not be considered in the order that would have to be given to the carder and spinner, because this is added afterwards, but, the waste that occurs through the mill must be considered, otherwise there will be a shortage.

DRAWING FRAME ELECTRIC STOP MOTION.

DESCRIPTION OF AN ELECTRIC STOP MOTION—POINTS ON THE CARE OF THE DEVICE—ADVANTAGES CLAIMED.

(*Contributed exclusively to* COTTON.)

BY H. W. C.

There are two kinds of stop motions used on drawing frames, namely, the mechanical and the electrical stop motions. Some makes of drawing frames have stop motions which are operated throughout by mechanical means. Others employ both electrical and mechanical, using the electrical for the back sliver stop motion and the mechanical for the empty and full calender roll stop motions and also the full can stop motion. The Howard and Bullough drawing frame is fitted with an electrical stop motion, a diagram of which is shown in the accompanying illustration. This make of drawing frame has stop motions operated wholly by electrical means.

The action of the stop motion is dependent upon the fact that a magnet is used, being made of a piece of U-shaped soft steel wire and covered by a series of spirally wound coils of insulated wire. When a current of electricity is passed through these coils of wire, the magnet becomes magnetized and has the power of attracting pieces of steel or iron to it. If there is no current of electricity flowing through the coils then the magnet has no attracting power. In order that a current of electricity may pass through the magnet coils there must be some connection or point of contact between parts of the machine connected to the poles 1 and 2.

The current of electricity is supplied by a small generator or magneto which is usually placed in some convenient position overhead. The two poles of the magneto are connected to the drawing frame by the poles 1 and 2. The poles are usually pieces of round iron wire about one quarter of an inch in diameter. The pole 2 is bolted to the frame and provides a way for the current of electricity to pass back to the generator or magneto. This pole may be designated the negative pole. The pole is known as the positive pole, and provides a conductor for the current of electricity to enter the drawing frame. The parts which are single cross-hatched, such as the back lifting roll 3, the four sets of drawing rolls 4, and the back calender roll 5, are all connected directly to the framing of the machine and are negative poles.

The front calender roll 6, the top lifting roll 7, and the cover 8, all of which are double cross-hatched, are connected to the positive pole 1. The front calender roll 6 is carried in the bracket 9 which is insulated from the bracket 10 by a fibrous insulator 11. This prevents any contact between bracket 10 which is a negative pole and bracket 9

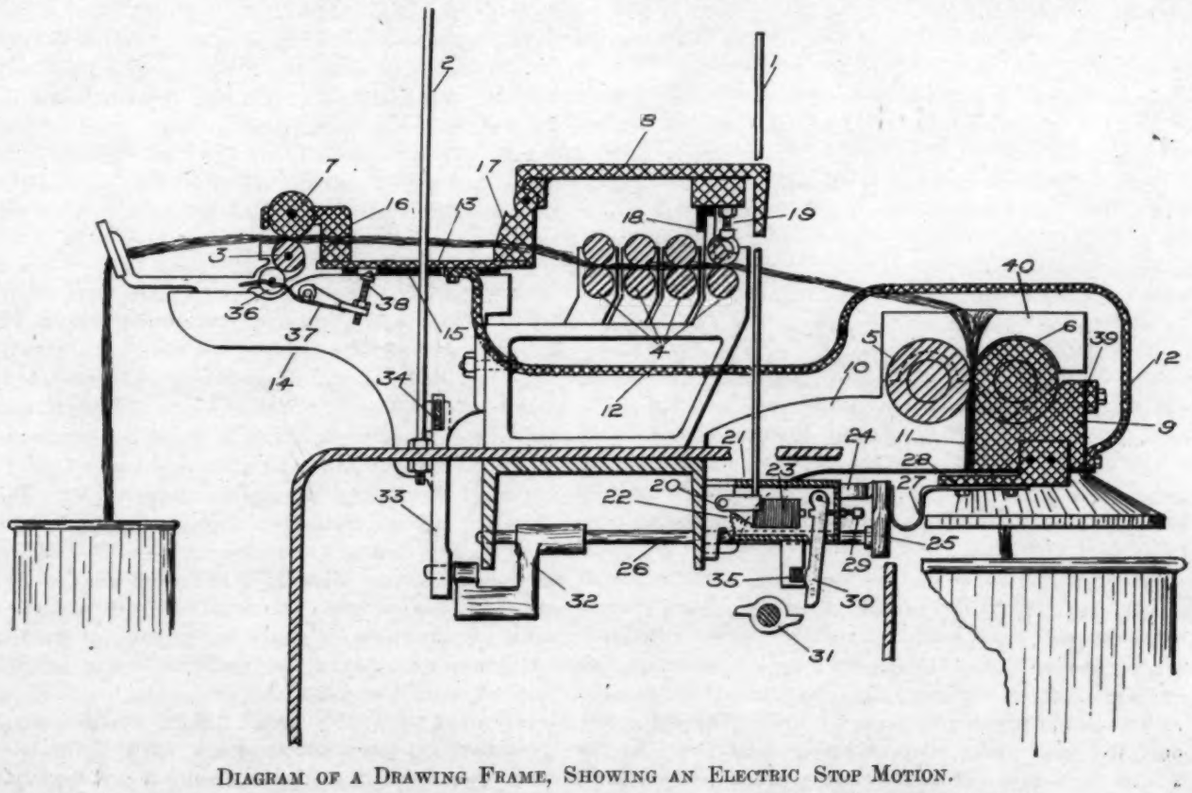


DIAGRAM OF A DRAWING FRAME, SHOWING AN ELECTRIC STOP MOTION.

which is a positive pole. The bracket 9 is fastened to the bracket 10 by a bolt which passes through a fiber bushing insulator which prevents an electrical connection at this point. The top lifting roll 7 and the cover 8 are connected to the bracket 9 by the connecting rod 12. As shown, this rod passes over the calender rolls 5 and 6 and under the drawing rolls 4, and is connected directly to the plate 13, which is insulated from the stand 14 by the fibrous insulator 15. The plate 13 is fastened to the stand 14 by a bolt which passes through a fiber bushing insulator and prevents any electrical connection at this point.

The stand 16 is bolted directly to the plate 13 and carries the top lifting roll 7. The stand 17 is also fastened to the plate 13 and provides a point upon which the cover 8 may be swung. The cover 8 rests upon the fiber insulator 18 which prevents the former from coming in contact with the roll stand. Screwing into the cover 8 is the adjusting screw 19. This screw 19 should never be in contact with the front top roll bushing.

Cotton is a non-conductor of electricity and therefore when passing between the lifting rolls 3 and 7 insulates them and prevents any electrical connection whatever. The cotton also insulates the front and back calender rolls 6 and 5 by passing between them.

The current enters the machine by the positive pole 1 which is fastened to the block 20. As the magnet box 21 is connected directly to the frame, it becomes a negative pole and therefore the block 20 is insulated from the magnet box by a fiber insulator and also a fiber bushing. Fastened to the bolt which holds the block 20 is the wire 22 which then passes around the magnet 23 a number of times and is then connected at the other side of the box to the spring 24. This spring is also insulated from the box by fiber insulators which give the current from the positive pole a clear way through the magnet box to the spring 24. The switch is designated by 25, and is fastened to the cross shaft 26 and insulated from it by a fiber bushing and key. When running, the switch 25 is in contact with both springs 24 and 27. The spring 27 is fastened directly to the bracket 28, which is bolted directly to the bracket 29, which in turn through the conductor 12 supplies current to the roll 7 and the cover 8.

Now suppose the frame is in operation and one of the cans at the back should become empty. This would allow the roll 7, a positive pole, to come in contact with the roll 3, a negative pole which would form a contact and complete the electric circuit. The instant these rolls 7 and 3 come in contact the current flows through the magnet coils, through the conductor 12 to the roll 7, to the roll 3 and back to the magneto by the negative pole 2. This current flowing through the magnet coils will magnetize the magnet which will draw the magnet finger 30 over to it.

As the magnet finger 30 is swung on a wire extending across the magnet box, the lower end of the finger 30 will be drawn over until it strikes one of the projections of the cam 31. This stops the cam 31 from revolving and its construction throws out the back half of the clutch of which it is a part. The back part of this clutch, when thrown out, comes in contact with a forked lever which is fastened to the cross shaft 26. This forked lever is forced back and turns the shaft 26 a slight amount and through 32 and the arm 33 it shifts the belt guide 34 which throws the belt onto the loose pulley, thus stopping the frame. As the switch 25 is fastened to the cross shaft 26, it is thrown out of contact with the spring 24. Spring 27 should always press against the switch 25.

This breaks the circuit and prevents any more current from entering this particular machine until the end is put in again and the frame started. The small square piece 35 is also connected to the cross shaft 26, and as the shaft turns slightly the piece 35 comes against the magnet finger 30 and forces it out of contact with the clutch 31, which leaves the clutch free to turn when the frame is started.

A scavenger roll 36 is placed under the bottom lifting roll 3 and is held against it by the spring and weight of the piece 37 which carries an adjustable screw 38. If an end should wind around the bottom lifting roll 3 it would force the roll 36 down, and the screw 38 up into contact with the plate 13 and complete the circuit and stop the frame.

If there should be a wind up on the front bottom or top drawing roll 4 it would rise until the bushing on the top roll came in contact with the screw 19. This would complete the circuit and stop the frame.

If the end should break between the front drawing roll and the trumpet, it would allow the front calender roll 6 to come in contact with the back calender roll 5 and close the circuit and thus stop the frame.

The rod 39, fastened to the front bracket 29 passes along the front of the frame and connects all of the brackets. Over each coiler is placed a spring which is fastened to the rod 39. As the can fills it gradually presses the coiler up until it touches this spring which closes the circuit which acts stop the frame.

The evenness and quality of the work depends to a large extent upon the senitiveness of the stop motion. If the frame is in good working order, it will depend upon the distance the magnet finger 30 is from the magnet 23. This can be adjusted by the screw 21. In setting the finger 30 move it in until the lower end just clears the projections on the cam 31. Then set the magnet so that both ends are about 1/16 inch from the finger. If the lower edge of the magnet becomes worn or rounded or if the projections on the cam become worn the finger will come in contact with the cam, but will be forced back a few times before stopping the cam from revolving. Small pieces of hardened steel are usually riveted to the cam and finger to overcome this, but unless they are carefully looked after and kept square, they will not be instantaneous in their action.

SHORT CIRCUITS.

Short circuits, either in the machine itself or in the magnet box before the current reaches the spring 27, are great trouble breeders and produce uneven work and a lot of waste. Short circuits in the frame itself cause the frame to continually stop with apparently no cause. If taken in the right manner it is a simple matter to determine just where the trouble is. If the frame continually stops for no apparent reason, first lift all covers and then try the machine. If it continues to stop, then the trouble is elsewhere. If it runs all right without stopping then the trouble is in one of the covers. Next drop the covers one by one until you find the one causing the trouble. It may be the screw 19 has become loosened and is touching one of the bushings on the top rolls. Again the insulation 18 may have become cracked, broken or loosened which allows the cover to drop down and form a short circuit. If the trouble is not found here then disconnect the conductor 12 from the bracket 9 and swing it up. Start the frame and if it still continues to

stop without any cause then the trouble must be in the rolls 16, 7, 3 or 36 or the screw 38. If it runs without stopping then the trouble must be somewhere in the calender rolls or the full can stop motion. First examine the springs over the coilers and make sure that there are none touching the coilers. Next examine the bracket 28 and see that there is no connection between it and the bracket 10. See that no oil cans are so placed that a connection is made here. It is a good rule to have no oil cans kept on the drawing frames at any time as they cause many short circuits and often fires have been traced to them.

Examine all the covers 40 and make sure that none come in contact with the bushings of the front calender rolls. It may be necessary to remove these covers and examine the bearings to see that no pieces of metal or other conductors are forming a circuit. Drawing tenders have been known to place such things as nails, hooks, hat pins, etc., in such places just to have a little fun with the fixer.

The cover which encloses the gearing that drives the calender rolls sometimes becomes loose and touches the end of the front calender roll forming a circuit. It is also possible that the insulation 11 or the filer bushing which insulates the bolt holding the brackets 29 and 10 has become broken and closes the circuit, stopping the frame. If the trouble is not found in the cover or the calender rolls, then it must be at the back.

Often the stands 16 become loose and strike the bottom roll 3 causing a short circuit. Then the scavenger roll 36 may have collected waste enough to force the screw 38 up into contact with plate 13. It may happen that the plate 13 is loose and forms a circuit with the roll 3 or a gear or bracket at the ends. Sometimes the fiber bushing holding the bolt fastening 13 to 14 becomes broken, allowing a short circuit to be made. These points will all cause short circuits..

If the frame does not stop when it should, then there is trouble in the magneto, the connections, or the magnet box. First examine the switch and see that both springs are clean and bear against the switch 25. If this is all right make sure that the magneto is in good working order and delivering the current. If these things are all right then there must be a short circuit in the magnet box. Examine the conductor 20 and make sure no hooks, oil can, or other metal, rests on the magnet box and touches 20 or the rod 1.

See that the fiber insulation and bushing are in good condition. Next make sure that the wire 22 is not touching the sides of the magnet box. See that the wire connected to the spring 24 and the fiber bushings are all right. It may be necessary to remove the magnet coil and test it to see if a short circuit is found there. A large amount of trouble is often caused by the pin upon which the magnet finger 30 swings. This pin often works loose and comes in contact with the spring 24 completing a short circuit.

A short circuit of this kind is enough to take all the current from a magneto and cause all the frames connected with the magneto to refuse to work when they should. If this proves the case then it becomes necessary to disconnect the wire 1 from each of the frames and then connect each one up one by one, trying them by placing a wrench between the cover 40 and the stand 9 or by breaking an end at the back to see if they stop. In this way the frame having the short circuit can be found and the trouble remedied, and still have the other frames working all right while it is being fixed.

If all connections are kept clean and free from oil and other foreign matters then the frames should run without much trouble. It is a good plan to try each frame four times a day to make sure they work instantly and do not allow the ends to run through the rolls before stopping. The magneto furnished is of the induction type which requires no brushes or collectors. It is simple and requires cleaning and a light oiling only once a week.

The advantages claimed for the electric stop motion are instantaneous action, reduction of waste, singles, and roller laps. On account of the sensitiveness with which it operates, it can be run at a higher speed, and give a relatively greater production in case of necessity, than can a mechanical stop motion frame. Some manufacturers claim that the cost of upkeep is less on electrical frames, due to the absence of small, delicate parts which are found on all mechanical stop motion frames and which are always liable to be broken.

WOOLEN MILL IN CHINA.

The P'u Li Woolen Mills, located on the Peking-Kalgan Railway, six miles north of Peking, began the manufacture of woolens in May, 1909. The mills were built under the general supervision of the Board of Military Affairs for the purpose of manufacturing uniforms for the Chinese army, and later it is hoped to supply uniforms for the navy. The institution is also serving as an industrial training school for the natives of this great wool producing section of China.

The buildings, erected by an English company, with offices at Shanghai, cover about four acres, and are constructed of native brick, with steel trussed roofs and cement floors, being practically fire-proof. The mills are equipped for the complete process of woolen manufacture, from the time the unscoured wool is delivered at the factory to the finished product of tailored uniforms and blankets.

The scouring machines, driers, oilers, willeys, dreadnaughts, carders, milling machines, and machines for finishing, raising, brushing, cutting, and pressing came from Huddersfield, and the 36 looms from Leeds. The chemicals for the "scour" were supplied by a German firm. There are 40 Singer sewing machines, but it is proposed to install 80 or 100 more before the tailoring department reaches full equipment. The machinery was set up by an expert brought from England. Four skilled workmen from Yorkshire have been engaged on a two years' contract to superintend the operation of the mills. As soon as native workmen are sufficiently trained, it is the intention of the Chinese authorities to dispense with all foreign service.

The chief product of the mills is woolens for heavy winter uniforms and goods, weighing three pounds to the yard, for overcoatings, and still heavier goods for blankets. The blankets are made waterproof and will stand a water test of 14 days. The 400 students in the military schools at Ch'ingho and the students in the mills have been supplied with black or drab colored uniforms. The mills have not been steadily running until recently, owing to the necessity of training the native operators. It is estimated, however, that the output will reach 432,000 yards per annum, each of the 36 looms having a capacity of 40 yards per day of ten hours.

The native operators are paid a daily wage of 13 to 17 cents gold, with quarters furnished by the company.

KNITTING

THE LOOP WHEEL KNITTING MACHINE.

CONSTRUCTION AND CARE OF CYLINDERS.

(Contributed exclusively to COTTON.)

BY ERNEST TOMPKINS.

Although the cylinder for loop wheel knitting machines is a simple affair—a wheel with needle supports and clamps on its rim—still there is so much to be said about it that but little can be put into an article of this character. There are two general kinds of cylinders, namely, "leaded" and "trick." The former have a hooked rim for holding leaded bases in which the needles are cast; the latter are provided with grooves in which the shanks of the needles lie, and with holes at right angles to the grooves into each one of which the bent or cranked end of a needle is inserted. The grooves preserve the spacing of the needles, and the holes preserve the constantly exposed length of the needle. Both the needle leads and the trick needles are held in position by screw compression plates or caps. Trick cylinders are classified, according to whether the gauge is changeable or not, as trick top and fixed or "old style." In the former the portion containing the tricks is interchangeable so that the gauge of the cylinder may be changed without purchasing an entirely new cylinder, which, although advantageous, necessitates a two-piece construction, which cannot be made as true as the single piece cylinder.

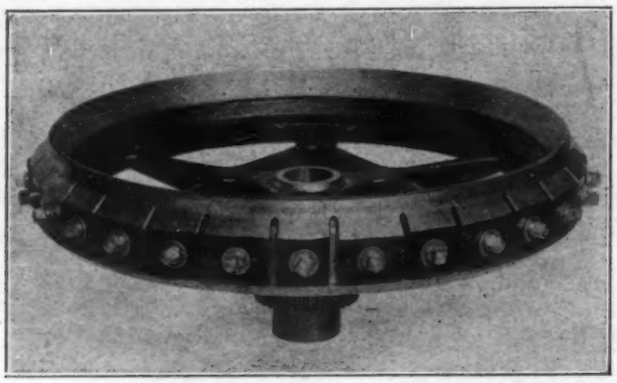


FIG. 1. DESIGN OF A TRICK CYLINDER FOR A LOOP WHEEL KNITTING MACHINE.

The latest design of trick cylinder is shown in normal position in illustration, Fig. 1. This is of the fixed type of trick needle cylinder, but will serve to show the general problems of cylinder construction. Probably the main requirement in a cylinder is true running, not only originally but maintained as well and as long as possible. For obtaining this the hubs are made reasonably long, the holes proportionately large and slightly tapered, and the rims are turned true. Moreover, the cylinder stem is made to fit the hole as perfectly as possible. It would seem as if under these conditions the cylinder would run perfectly true and for a reasonable length of time. Indeed it would seem that these points would be understood without mentioning them. It is only within a couple of years that a cylinder stem having a truly conical surface and made accurately to gauge has been available to the knitting public. The word "conical" may be misleading without the explanation that it is used in the technical sense, since the taper is so slight that the observer will fail to detect it.

Former stems and most of those on sale at present were turned in an engine lathe and then filed to fit the ring gauge or cylinder. This method of finishing is so common that it has generally been accepted as satisfactory, but both theoretically and practically it produces an irregular surface so that the bearing is in spots instead of on the entire surface with the result that although the stem may appear to fit, yet these spots will soon be rubbed down so that the cylinder will become untrue at a rate proportionately to the filing done on the stem.

The new stems are ground accurately to size and taper and the greatest care is observed to make them duplicates. Of course it goes without saying that the cylinders themselves should be turned "dead true"—to use shop parlance—and the purchaser generally takes it that this has been done. In reality the machinist has to contend with hard spots in the casting, since no castings are alike throughout their whole extent. The hard spots spring the tool or the scraper so that high spots are left in the cylinder. The elimination of these high spots requires a degree of experience and skill out of the ordinary.

There are, however, other conditions which have to be met, namely, the distortion of the rim due to the clamping screws and plates, the distortion of the hub due to the method of securing the driving gear, and the bending of the stem due to the pressure o fdriving. The distortion of the rim is apparently of two kinds, one of which throws it out of round and the other which bends the upper portion of the rim inwardly. Although this distortion is most noticeable when the needle plates strike each other and form an arch, still it exists to an extent even when the plates do not interfere. These troubles may be decreased and practically eliminated by increasing the number of spokes in the cylinder, thus resisting the tendency to eccentricity, and by making the rim wide in proportion to its depth thus decreasing the inward bending. In the case of cylinders having removable trick tops the rim and spokes are generally sufficiently rigid to resist distortion which is then likely to manifest itself in springing the trick top unless this has a considerable radial depth and is well provided with securing screws.

Methods of reducing the distortion mentioned above are well illustrated in the trick cylinder shown. The rim is a box section which makes it so stiff that it resists twisting, yet since it is hollow it contains but little if any more material than the older but more flexible rim. Moreover, six points of support are provided by the tangent spokes which are rigid in spite of comparative lightness.

The old cylinders were generally driven by a gear, either spur or bevel, secured to the hub of the cylinder by a set screw or key. Obviously the set screw would tend to distort the hole in the hub, and although the keys used were provided with clearance at the top and bottom in order to prevent this distortion, still the side stresses often produced it so that with both of the old methods either the cylinder would be thrown out of true originally, or would become so

from the yielding of the stem under these pressures even without changing the gear. Subsequently when the gear became worn, or for other reasons had to be replaced, this replacement was frequently done by inexperienced help so that the cylinder would be thrown out of true even more than before. Inasmuch as the causes were not generally understood the trouble would be blamed either to improper manufacture originally or to worn or misfit stems. This trouble is overcome completely in the trick cylinder shown. The gear instead of being held with a set screw or key is threaded in the direction of motion against a substantial shoulder, so that the hub is really re-inforced against distortion by the gear instead of the reverse. Moreover, the gear may be replaced more readily than by the old methods, and no matter how inexperienced the operator, the cylinder cannot be injured by the replacement.

SPACING THE NEEDLES.

Up to this time the question of the spacing of the needles and their uniform height has not been discussed. With the leaded needle cylinder this is taken care of by the mold, which is a subject by itself. With the trick cylinder the spacing of the needles of course depends upon the spacing of the grooves, and the uniformity of the height of the needles depends on the perfection of the alignment of the holes for receiving the needle cranks.

It is the general impression that the spacing of a trick needle cylinder is practically perfect just as it is the general impression that the making of a true cylinder is comparatively easy. In reality the correct spacing of the grooves is obtained only by extreme care in the selection, adjustment and operation of the cutting machine. Some realization of this may be obtained from a parallel, but extreme case, which is the marking of dials for measuring instruments such as transits, telescopes, etc. There is in the basement of the Coast and Geodetic Survey Building at Washington, a masonry room in which is the dividing engine for graduating dials of this kind. The screw and worm wheel are made with such extreme care that the cost would be prohibitive for ordinary machine tools. Change of temperature in the room is guarded against with the greatest caution. The only light admitted comes through a small glass window and the source of this light is so arranged that practically no heat reaches the room, but even that is maintained invariable. The operator enters the room, puts the dial in position for cutting but without starting the machine, retires and locks the door, and after the machine has recovered from the distortion occasioned by the heat from his person he starts the machine by mechanism operated from without the room and does not again enter the room until after the cutting is finished, since the machine stops automatically.

It is needless to state such care would make the cost of a trick cylinder prohibitive, but this illustrates the extreme beyond which is perfection. Early trick cylinders were cut at the other extreme; that is, with dials no more accurate than commercial outlay would warrant, with machines of the same class, with cutters of large diameter and with comparatively little attention to changing conditions during the time of cutting. Indeed that time was so long that considerable changes were sure to occur. The cutting of the trick cylinder illustrated is done with as near an approach to scientific accuracy as commercial conditions will allow. The the hubs have been filed or emery-papered, or changed in some other way. Unbelieveable as it may seem it is not unsame is true of the drilling. A careful test of a 40-gauge 24-inch trick cylinder showed an error of one and a half thousandths, which is a radial error of three-fourths of a thousandth—a degree of accuracy probably never before reached in the construction of a loop wheel knitting machine.

CARE OF CYLINDERS.

The needle caps should never be tightened much more than is necessary to hold either the leads or the trick needle. With the latter there is very little excuse for severe pressure unless the leathers are so much indented that they will not hold the needles secure in any case. The proper remedy is the use of new leathers instead of extreme pressure. With the leaded needles the leads should fit close together, so that the tendency to tip will be resisted by the friction between them. With either type of cylinder, the plates should not crowd each other.

The hole in the sub should be kept free from lint, grit and dirt, and before the cylinder is placed on the stem both the latter and the hole should be thoroughly cleaned out and oiled with a good quality of fairly heavy oil. If the machines are new and the cylinders do not fit the stems, the trouble should be remedied by the builder of the machinery. Any reputable builder would rather make the wrong right than be discredited by its remaining wrong, and he can remedy the difficulty best before the stems or the holes in heard of for an operator to enlarge the hole in the hub with a half-round file.

When the cylinder is off the machine the caps should be kept in position and should be carefully protected from rust, and the portions which hold the needles should not be allowed to touch anything hard. One method of storing trick cylinders is to lay them on a smooth pine board bottom up, and slide the board and cylinder into a compartment made for the purpose. This method keeps dust and dirt away from the cylinder and leaves the tricks down out of harm's way. Another method, which, although less neat, is cheaper and more convenient, is to fasten strong pegs in the wall and place the cylinders on these with the rings inward but not touching the wall, which may be secured by a block or shoulder on the peg.

TEXTILE DIRECTORY.

THE TWENTY-THIRD ANNUAL EDITION of the Blue Book Textile Directory has been issued, showing 550 new mills and firms added this year. The office edition has 1,060 pages, and the travelers' edition 900 pages, the office edition being printed on fine coated paper with a large page, while the travelers' edition is printed on light paper.

The textile maps have been revised to date, these showing all towns at which textile mills, dye, print or bleach works are located. The volume shows activity in the knitting industry, there being 250 new enterprises listed. The directory names all textile manufacturers in the United States and Canada (including in the office edition a classified directory of cotton and woolen mills and a directory of textile mill supplies, covering machinery, chemical and dye-stuff manufacturers), with commission merchants, yarn dealers, cotton, wool and waste dealers, etc.

The book is published by Davison Publishing Co., and may be obtained through this office.

DYEING, BLEACHING AND FINISHING.

CHEMICALS USED IN THE TEXTILE INDUSTRY.

(Contributed exclusively to COTTON.*)*

BY DR. FREDERIC DANNERTH, CONSULTING INDUSTRIAL CHEMIST.

The term alkali is applied to a class of "inorganic" substances which in most respects present a striking contrast to the acids. The layman has observed a difference in taste and so remarks that vinegar and lemon juice and unripe apples have a "sour" taste, while soap and baking soda and some natural waters have an "alkaline" taste. All the alkalis are colorless and odorless with the exception of ammonium hydroxid (ammonia water) which possesses a characteristic, pungent odor. The vegetable coloring matter, litmus, is turned blue by alkalis and red by acids, a fact which holds good for many other vegetable coloring matters. One interesting and important reaction of alkalis is their action on textile fibers. Wool is dissolved by a boiling 5 per cent solution of sodium hydroxid while cotton is only contracted (but not dissolved to any extent) by a hot 25 per cent. solution of the same reagent. Opposed to this we may notice the effect of acids on these fibers: Wool is not affected by cold 50 per cent. sulphuric acid while cotton is attacked immediately by this reagent.

The early chemists observed that solutions of caustic potash and caustic soda left a white residue when the water was evaporated while the solution of caustic ammonia evaporated completely without leaving any residue, hence they termed the two former substances fixed alkalis and the latter substance the volatile alkali. They further observed that all the substances which turned litmus paper blue were not of the same chemical group. Thus the aqueous solutions of soda ash and borax and waterglass were weakly alkaline and did not contain the so-called "hydroxyl" group which is characteristic of the hydroxides of sodium, potassium, ammonium and calcium, hence they termed the latter substances "caustic alkalis" and the former group "milk alkalis." Incidentally I might remark that the substance termed "lunar caustic" does not belong to this group of substances, the word caustic merely having reference to the action of the substance on the human skin.

Chemists explain the character of the alkalis by saying that they all contain the "hydroxyl" group (O-H) and are therefore closely related to water (H-O-H). The milk alkalis are distinguished from the caustic alkalis by the fact that they do not contain this hydroxyl group, but they do contain a strong alkali (sodium) in combination with a weak acid and therefore they undergo a change when dissolved in water. This change has already been referred to as "hydrolysis" and it may in this particular instance be tested for by inserting a strip of red litmus paper into the solution. The familiar compound known as soda ash may be used to illustrate the point. Soda ash (sodium carbonate) is a compound of a strong alkali (sodium) with a weak acid (carbonic acid). When ten grams of sodium carbonate are dissolved in one liter of water a definite part of the sodium unites with the hydroxyl group (O-H) of the water to form sodium hydroxide and this substance turns red litmus paper to a blue. The reaction may be represented by the following symbols:

sodium carbonate + water = sodium bicarbonate + sodium (hydroxide.

$$Na_2C\,O_3 + H\,O\,H = Na\,H\,C\,O_3 + Na\,O\,H$$

The sodium bicarbonate here formed is familiar to many of us in its dried form as baking soda. Its use in baking depending upon the fact that when heated it gives off carbon dioxide and leaves sodium carbonate.

Borax (sodium biborate), waterglass (sodium silicate), phosphate of soda (sodium phosphate) and sodium sulphide are other examples of compounds in which a strong alkali is combined with a weak acid, so that they all show an alkaline reaction when dissolved in water.

SODIUM HYDROXID (Caustic Soda) occurs in commerce as a white fused mass in iron drums. When opening these large containers it must be remembered that caustic soda has a great attraction for water and carbon dioxide, and as this latter gas converts the soda into carbonate of soda (soda ash) the drum should be kept covered. Trade samples have been found to contain from 75 per cent. to 97 per cent. of actual sodium hydroxid, the balance being made up of such impurities as sodium carbonate, sodium chloride (common table salt), sodium sulphate (Glauber salt), sodium silicate (waterglass) and sodium aluminate. In taking samples for testing, care must be observed as the contents of a drum are seldom uniform. The portions which have chilled quickly; those on the walls and bottom of the drum are fairly representative of the average composition. The portions in the interior of the drum have cooled slowly and hence the impurities have remained in solution until after the caustic soda has crystallized. As a result of this, the interior portions are not homogeneous.

A caustic soda solution having a specific gravity of 1.014 (2.8 Twaddell) should contain 1.2 per cent. actual sodium hydroxid. A 10 per cent. solution shows a specific gravity of 1.115 while a solution showing a specific gravity of 1.530 contains 49.02 per cent. sodium hydroxid. When purchasing caustic soda the strength (percentage of actual sodium hydroxid) should invariably be specified by the supply house but the methods in vogue in the majority of textile œmills have made it possible to sell low grade "caustic" at fancy prices to manufacturers.

Caustic soda is the most important of the alkalis as it combines effectiveness and cheapness, properties which are especially desired in the cotton industry. Its use in the woolen industry is limited by the fact that the latter fiber is rendered tender by weak solutions of this substance. In the boiling-off of cotton it is used to emulsify and dissolve the wax and other impurities which surround the fiber. The raw cotton fiber is rendered waterproof by this wax so that it can not be "wet out" evenly. The removal of the wax is facilitated by adding to the liquor a small quantity of sulphated castor oil as a "solvent agent."

The mercerizing of cotton consists essentially in the treatment of cotton yarns or fabrics with solutions of caustic soda while under tension (to prevent contraction). The specific gravity of the solution should be about 1.300 to 1.345, and the operation should be conducted at a temperature of 68 degrees Fahrenheit.

In discharge printing with basic colors the tannin-antimony mordant is sometimes discharged by means of a caustic soda paste previous to dyeing out. In the production of Diazo colors, caustic soda is used as a solvent for the Alpha or Beta-Naphtol. The production of "crepon effects" on cotton fabrics depends upon the fact that those places which have been printed with the caustic soda paste will contract while the untreated portions retain their length and therefore "crinkle." The rosin soap used in connection with the boiling-off of cotton is prepared by boiling up the colophony with a calculated quantity of concentrated caustic soda to a clear solution.

The purification of water by means of caustic soda is the only true method of softening as by this treatment the impurities are actually removed from the water. The carbonic acid is absorbed, carbonate of soda is formed and this reacts with the sulphates to form insoluble carbonates of lime and magnesia. Thus all the impurities are rendered insoluble and may be separated from the water by simple sedimentation.

POTASSIUM HYDROXID (caustic potash) may be used for all the purposes mentioned under caustic soda, but it finds limited application because of its higher price.

AMMONIUM HYDROXID (ammonia or liquid ammonia) is really a solution of ammonia gas in water. Liquid ammonia is the term applied by chemists to the product obtained by liquifying gaseous ammonia ($N H_3$) by pressure. The strength of an ammonia solution is usually calculated from its specific gravity taken by an hydrometer. The strongest ammonia of commerce has a specific gravity of 0.886 and contains approximately 33 per cent. of actual ammonia gas. This solution is used in a large variety of cases for neutralizing acids in textiles, as it does not attack either the vegetable or the animal fibers when diluted. It is used to advantage as an assistant in the scouring of raw wool and spun wool—operations in which caustic potash and caustic soda are barred because of their solvent action on the fiber. Ammonia finds limited application as a stripping agent but its chief advantage lies in its detergent action and the fact that it volatilizes readily at ordinary temperatures.

CALCIUM HYDROXID (lime, milk of lime, caustic lime) is the name applied to the solution of lime (calcium oxid) in water. In the indigo dyehouse it is used in the preparation of the "fermentation vat," the "copperas vat" and the "hydrosulphite vats" for neutralizing the acid which is formed, as indigo white is soluble only in alkaline solution. Large quantities of this substance are also used in the rational purification of water. The use of lime for removing the temporary hardness of water was first proposed by Thomas Henry of Manchester, England, and first carried out on a commercial scale by Clark. It depends upon the fact that milk of lime which is added to the water attracts the carbon dioxide of the bicarbonates, thereby forming carbonate of lime and converting the bicarbonates into carbonate of lime (or magnesia, as the case may be). Carbonate of lime (Chalk) is of course insoluble in water and may be removed by simple sedimentation. In order to remove any sulphates which may be in the water, it is necessary to add carbonate of soda (soda ash) afterward.

SODIUM CARBONATE (soda ash) was first prepared on an industrial scale by the "LeBlanc Process" in which common sea salt was used as raw material. This has now been superseded by the "Solvay Process" in which common salt the price of 100 pounds of 58 per cent. strength will be:

If 100 pounds of 48 per cent. strength costs 60 cents, is treated with ammonia and carbon dioxid. The products obtained are bicarbonate of soda and sal ammoniac. The "bicarbonate" is easily converted into the "carbonate" by simple ignition. Soda ash is sold in trade on a basis of 48 per cent., and for every per cent. over 48 per cent., 1/48 is added to the bill. To illustrate the point:

58 — 48 = 10 and 10/48 of 60 cents = 12½ cents.

60 cents + 12½ cents = 72½ cents cost.

The 58 per cent. refers to the percentage of sodium oxid in the sodium carbonate. Thus, 100 parts of pure sodium carbonate contain 58.4 parts of sodium oxid, hence the purest sodium carbonate obtainable will not show more than 58 per cent. strength. The molecular weight of Na_2O equals 62, and that of sodium carbonate is 106, therefore 106 : 62 : : 100 : 58.4.

BORAX is the commercial name for sodium biborate. It occurs in trade as colorless crystals but mostly as a white powder. It is prepared to some extent from the native boric acid of Tuscany (central Italy) but most of the borax of commerce is found as a deposit incrusting the soil of marshes in certain parts of California (Clear Lake, 100 miles from San Francisco). Crude borax contains a certain amount of chlorides and sulphates in addition to large quantities of insoluble matter. At the present day borax has almost entirely disappeared from the dyehouse, its last most important function being that of a solvent in connection with "alkali blue." Alkali blue is essentially an acid dye but differs from the other members of this group in that its color-acid is insoluble in acidulated water. Hence the dye is dissolved in water to which 5 to 10 per cent. is added for each 100 pounds of wool. The dye is taken up by the wool in the form of its colorless compound and later is converted into the insoluble color-acid by passing the goods through a bath containing 5 per cent. sulphuric acid. In the manufacture of finishing preparations containing caesin, this substance is rendered soluble by an admixture of borax.

WATERGLASS is the commercial name for sodium silicate. It is prepared by fusing silica (sand) with Glauber salt and charcoal. It occurs in trade chiefly as a solution of 40 degrees Baume (specific gravity 1.385) at 60 cents per 100 pounds and as a solution of 60 degrees Baume (1.715 specific gravity) at $1.50 per 100 pounds. The solid lumps of waterglass find little application in the textile industry because of their pronounced insolubility in water. Samples of desirable waterglass should show a silicic acid content of at least three times the sodium oxide content, as this insures the absence of large excess of alkali. Sodium silicate is used as a fixing agent for chromium, iron and aluminum mordants; as an addition to "peroxide" bleaching baths; as an addition to the boiling-out bath for cotton; as an addition to soap for the purpose of increasing its scouring efficiency or for reducing the price of the article. It is used to some extent in connection with sizing and finishing mixtures especially for the purpose of rendering fabrics fireproof. Finally, but by no means of least importance, is its use as a fixing agent in the modern tin-phosphate-silicate process for weighting silk. For this purpose it is used as a concentration of 6 degrees Baume. In certain cases it has been observed that spots are formed by the treatment in the silicate bath. These spots can, however, be removed with the aid of ammonia.

SODIUM PHOSPHATE of commerce is strictly speaking di-sodium phosphate in distinction from the tri-sodium phosphate commonly used as a boiler-water-softener. The former compound is discussed at this point as it in common with the three previous compounds possesses a slightly alkaline reaction. This is in every case due to the fact that a strong base is combined with a comparatively weak acid. Such compounds undergo hydrolysis when dissolved in water with the result that a small amount of alkali-hydroxid is formed and this in turn gives the alkaline reaction.

Sodium phosphate is used in the dyeing and printing of substantive dyes, as it is supposed to produce clearer shades than can be obtained when Glauber salt and common salt are used. It is used occasionally as a mild neutralizing agent for diazo solutions; as a fixing agent for aluminium in Turkey red dyeing as a substitute for the dung bath. The most important use to which this substance is put, is in connection with the tin-phosphate-silicate process for weighting silk. In this process the silk is passed successively through baths of tin tetrachloride, sodium phosphate and sodium silicate.

The stannic hydroxid which is applied to the fiber in the first bath is converted into tin phosphate by the subsequent passage through the bath of sodium phosphate. This bath is made up to a strength of 4 to 10 degrees Baume, depending upon the amount of tin which is to be "fixed."

SODIUM SULPHIDE occurs in commerce in crystals of a brown shade. It is highly hygroscopic so that the containers should be kept well closed. An analysis should not show any considerable amounts of free caustic soda. The chief use to which sodium sulphide is put is in connection with the modern "sulphur" dyes for cotton. It is used here as a solvent for the dyestuff in the proportion of one pound of the crystals to one pound of the dye. Sodium sulphide may be formed by several reactions, so for example by heating sodium sulphate with charcoal; by heating sodium carbonate with sulphur; by boiling sulphur with caustic soda. Of these the latter is the most convenient for laboratory experiment while the first named is the technical method for preparing the salt.

DYEING OF COTTON HOSIERY.

(Continued from August.)

BY DR. C. FISHER.

PART II.

Another substitute for aniline black has been found in sulphur blacks. Their introduction has revolutionized the methods of dyeing black on hosiery, and although developed blacks are still preferred by a good many manufacturers for the very best grade of goods, sulphur blacks have found so much favor in the eyes of the dyer that there is hardly any hosiery mill in the country that does not use sulphur black to a large extent. Some manufacturers have abandoned aniline black entirely, others have reduced the production of their aniline black considerably in favor of sulphur black, and others again are using, besides these two kinds of blacks, also the developed blacks.

There has been much talk against sulphur black in the beginning and when sulphur black was first put on the market a good many of these complaints were fully justified. Some blacks were not sufficiently soluble, others were very sensitive to the oxygen of the air, which caused a lot of trouble in the dyeing, and complaints were heard that sulphur black would rot the goods even worse than aniline black. All this has been gradually overcome. There are now sulphur blacks on the market that will dye just as easily as direct colors. The solubility is perfect, the black does not produce so-called sulphur spots any longer, and does not affect the strength of the goods in the least.

In order to obtain perfect results, it is necessary to wash the goods thoroughly after the dyeing. The washing of the sulphur blacks is of most vital importance, and it is this part that is very often neglected. The goods should be rinsed in cold water very thoroughly, in order to remove the excessive sulphide of soda which is used in the dyeing process. If this chemical is not removed, it will gradually neutralize and form acid salts of sulphuric acid, and this acid will carbonize in the cotton fiber in the storing of the goods and rot the same. I have always advocated thorough washing of the goods after the dyeing, and to my knowledge we have never had any complaints from any of our customers. I have examined goods that had been stored away for years, and their strength was just as perfect as on the very first day.

The dye liquor should be kept at the same density in the standing kettle; this is another thing that has to be watched carefully. A twaddle meter should be used in order to be able to tell whether the dye liquor needs any salt to bring it up to the proper specific gravity.

It will be found that in twaddling the dye liquor at the boil one will not get a fair idea about the density of the same, as the hydrometer will register too low at so high a temperature. The best thing to do is to twaddle at a temperature of about 195 degrees F. The first bath will not show more than about 1 degree Tw. as a rule, or not even that much. It is not necessary to twaddle the first two or three kettles, as one has very little trouble in obtaining equal batches for three or four consecutive dyeings, if the instructions are properly followed.

It is with the standing kettle, however, that the dyer has to use his judgment, and here it is where the twaddle meter will tell him exactly what to do. If it registers about 3 degrees to 4 degrees no salt will be needed; if it is less than 3 degrees, from 5 to 10 per cent. of salt should be added. In some cases, especially where a rather short dye liquor is used, it will be found that the density is going up in spite of the fact that no salt was added. This is due to the sulphide of soda added to the dye bath, which is gradually converted into Glauber's salt. In a case like that it will be found necessary to weaken the dye liquor by drawing off one-quarter to one-third of its volume and diluting it with water. In this way the density can easily be regulated and kept up at its proper degree.

In starting a fresh bath it takes a rather high percentage of dyestuff, no matter whether sulphur black of single or double strength is used; in every instance the percentage of dyestuff in the standing kettle is just one-half of what it took for the first kettle. There are sulphur blacks of more or less solubility, and the solubility of the dyestuff regulates the amount of sulphide of soda required to help to dissolve the same. Some soda ash is added to the dye bath in order to correct the water, or, rather, to increase the alkalinity, and either common salt or Glauber's salt may be used in the dye bath.

The shade of sulphur black can be easily regulated by the amount of sulphide of soda and salt. If the dye liquor contains too little sulphide of soda and too much salt, the shade is liable to turn rather reddish; with an excess of salt

the black will even be more or less bronzy. When sulphur black is reddish, brownish or bronzy, the twaddle meter, as a rule, will register too high; that is, more than 4 degrees. In order to obtain the proper shade in this case, the amount of salt should be reduced or left out entirely. If this does not suffice, the bath should be diluted somewhat, in which case a small extra addition of dyestuff and sulphide soda should be given, in order to make up for the loss caused by diluting the dye liquor.

The dyeing of sulphur blacks is carried out at the boil or at a temperature just below the boiling point. The goods can be entered dry into the dye liquor, to which all the necessary ingredients have been previously added. Soda ash and sulphide of soda should be dissolved first before the dyestuff is added. The dye liquor should be kept at the boil while the dyestuff is dissolving. After a thorough solution has been obtained the dye liquor should be twaddled; that is to say, if it is an old dye liquor.

I have mentioned the importance of the use of the twaddle meter before, but I want to emphasize once more the necessity of twaddling an old dye liquor, as good results depend entirely upon proper attention at this particular point. The washing can be done either right in the same machine, while the dye liquor is kept in the meantime in a storage tank, or the goods are lifted out of the dye liquor in a cage by means of pneumatic hoist and washed in a separate tub. At least three cold waters should be given in order to obtain clean goods. Some dyers give a hot water toward the end of the washing process, but as sulphide of soda is easily soluble in cold water, this will not be necessary. The addition of a small percentage of acetate of soda to the last rinse water has also been recommended by some as a prevention of the formation of free acid, but we have never found it necessary.

The softening of the goods plays a very important part, and the appearance of the goods depends a good deal on selecting a proper softener. There are a good many softeners on the market, and it is the dyer's business to select the best one for his particular purposes. All softeners are emulsions of soaps, alkalies and oils. The best softener is an emulsion of a neutral soap and some oil of vegetable origin; sulphonated oils, like Turkey red oil or alizarine oil, do not produce the desired effect, as these oils will not have the same beneficial influence on the shade of the black as an oil proper.

The softeners are applied at a temperature of about 120 degrees to 130 degrees F. for 15 to 20 minutes.

The diazotizable blacks, as well as sulphur blacks, are very well adapted for the dyeing of yarn used in the manufacturing of white foot goods or goods with white toes and heels. Both of these blacks are very fast to washing, and will not stain the white in goods of this kind. The yarn may be dyed in open kettles on sticks, or in more up-to-date yarn dyeing machines. If open kettles are used, sulphur black should be dyed on bent sticks, in order to keep the yarn submerged as much as possible in the dye liquor.

The application of diazotizable, developed colors and sulphur colors for fancy shades is of great importance. There is a general tendency for fast colors in the textile market, and the hosiery manufacturers have been compelled to get in line. In most cases ordinary direct colors have been satisfactory, and will always be used for cheap goods, although the fastness to washing is only moderate, but for higher grade goods, tans, navy blue, red and wine shades are dyed with diazotizable colors and sulphur colors.

Goods made of mercerized cotton can be dyed with the different groups of cotton colors mentioned above. Mercerized cotton has a greater affinity to dyestuffs than ordinary cotton, consequently it takes less dyestuff and less salt to dye the same. On account of its greater affinity, it is necessary to exercise a little more care in dyeing mercerized goods, especially in adding the salt only after the goods have been in the dye liquor for some time and after the larger part of the dyestuff has been taken up by the cotton. An addition of soap, phosphate of soda and sal soda facilitates the obtaining of level shades.

Silk hose is best dyed with diazotizable colors; some direct colors will be found satisfactory, too, but only those of superior fastness to washing should be selected. Diazotizable colors will produce splendid results on silk hose of all shades, as their fastness to washing is far better than anything that could be produced with ordinary acid colors. Woolen stockings can be dyed with fast acid colors; that is, colors that are fast to scouring or washing. Union hose, a mixture of wool and cotton, is dyed with diazotizable colors, and in many cases, especially for blacks, cross-dyed with a fast acid color.

INQUIRY.

EDITOR OF COTTON: We have since the beginning of this year been receiving inquiries from textile manufacturers in all parts of the country regarding the disposal of their waste waters (scouring, dyeing and bleaching liquors). It appears from these letters that they have in certain cases been given notice to stop the pollution of the streams, so that this is a matter which promises to involve the industry at large. We have taken it upon ourselves to investigate several of these cases in the hope of compromising with the exacting demands of the city authorities. We shall be interested to hear from textile manufacturers who have received notice from city authorities as well as from manufactures who fear such action, as we are at this time collecting evidence to prove the harmlessness of such effluents. By forwarding information in regard to this matter the manufacturer places himself under no obligation to us whatever, but he will on the other hand assist materially in the solution of the trade difficulty.

FREDERIC DANNERTH LABORATORY OF INDUSTRIAL CHEMISTRY, Philadelphia, Pa.

CAMERON SEPTIC TANK CO., 352 Monadnock Block, Chicago, Ill., have recently mailed out a letter to municipalities and others operating the Sewage Disposal Plants involving the Septic Process, advising them of the present status of litigation involving that patent. The letter states that the company is entirely confident that the Supreme Court, where the case is now on the docket for the October term, 1910, will decide the issue in favor of the Cameron Septic Tank Co. The validity of the patent was sustained in the United States Circuit Court of Appeals and the company has every reason to believe that the Supreme as the final arbiter of all matters involving the application of an International Treaty will have the contention of the company established. The company states that they are issuing many licenses for existing plants upon terms both reasonable and satisfactory, but that it should be remembered that the longer the settlement is deferred, the more expensive it must necessarily become, as it involves payment for the length of the time during which infringing plants have been in use.

Practical Problems Discussed by Cotton's Readers.

Discussions of Mill Problems are Solicited for this Department.

DRAWING-IN ROOM HELPS.

F. L. B.

Every mill wants to get its drawing-in done right and with as little expense as possible. A great help in this direction is a warp drawing machine. With such a machine warps can be drawn in better, quicker and cheaper than by hand, and with much less trouble, as there is not so much help needed to do the work, and it is also much less trouble to teach a hand to run a machine than to teach one to do anything like good drawing-in.

A drawing-in machine will draw flat duck, corded work, twills, herring-bones, or any combination which it is possible to draw in for a one beam six harness weave. It will drop any desired number of harness eyes to permit the drawing of a lower sley than the harnesses were intended for. This is done by pattern chains that require one setting only.

As there are many machines already in use throughout this country, I will give a few points which I hope may be of service. We will suppose we have a six-harness machine, and want to draw a three-harness drill in a reed with 30 dents per inch, harnesses having 32 eyes per inch. Peg up the pattern bars on rods 1, 2 and 3, then peg rod No. 6, just like No. 3 rod. This will draw either two left and one right hand harness or one left and two right hand harnesses, depending upon whether you hang the harness at 3 or 6. It will be seen if you hang a harness at Nos. 3 and 6 both, it would draw them both just the same as it would one harness, because the pattern bars are pegged alike.

It is best to have two rods to fit No. 1 place. Both should be numbered 1. These rods can be set in such a manner by getting two rods with a left hand worm that will push the eye to where the needle will go as near the center of the eye as possible. The difference can be made up by running the worm further up on one rod (this worm has a thread hole through it and the rod screws into to it from both sides, right handed) until the needle comes directly to the center of the eye. No matter which one of the rods is in, the harness cannot be hurt. Now set the other rods two for a place, or in other words have two sets of rods as a plain loom has two shuttles. The weaver has one threaded to put in when the other runs out. The helper can have the other set of rods in the harnesses and all there will be to do will be to hang them up.

With a 32 harness, you will run a chain with 90 cam links and 6 blanks, which will give the right drop for sley. Now take a piece of hoop iron, run it right up the back of the thread rod finger with two holes. Have it one inch higher at the top with a nail hole in it. Bend the nail at the point, put it through the hole and catch it in the oil hole on the head directly in front. This will keep the finger from going back for the drop and when not dropping eyes, no chain need be used on the thread rod. Neither will one with a drop in it have to be taken off.

The best remedy for a warp that has a heavy size is to throw the felt over the brass lever; take a fine lease comb and comb from the wood clamp up to the warp rod. Then bring the felt back to its proper place and comb from the warp rod to the felt.

COMMENTS ON THE CLOTH ROOM.

E. S. A.

The cloth should be taken into the cloth room from the loom without getting it any dirtier than can possibly be helped. Then it goes into the hands of the stitcher boys who should be made to run the cloth straight in the roll, so that as it goes on through the room it is easy to keep wrinkles out of it. Also instruct him to keep the selvage straight.

The brushes on the brusher should be kept clean and all the threads should be picked off so the machine can do it's work properly. Keep the pans and dustways open, and oil regularly to prevent fire. The cloth then goes into the hands of the folder who has a great deal of responsibility on him. He can give away by degrees enough cloth to amount to hundreds of dollars in a short while if he is not very careful in having his machine set right.

He should be quick with figures, and if he does his work properly he has no time to study about things that have passed. His mind and attention should be on his work and he should be very careful to keep the selvage even and straight and never allow the machine to fold a cut with the selvage turned, as there is no chance after it is folded to get it straight.

The inspection of the cloth is very important. The inspectors should be persons who do their work right, without any regard to friends or a friend in the weave room. A little partiality like this would cause considerable trouble if it were allowed. The tackers should take great pains in doing their work, and be economical with their thread.

The stenciling is very important. To make the cloth look neat and nice it must be folded, tacked, and stenciled without blots and blotches. To prevent this the stencils must be kept clean. The ink used should be good to do good nice work. Mark the yardage plainly on every cut, so there will be no trouble in reading fractions.

The baling is also very important. To make bales look nice, and easy to handle, keep the sides and ends even. Take pains to put in nice heads and use plenty of burlap and paper, but not too much as it would be simply a waste. In marking the bale number and number of yards, always use good fluid and be very particular to make the figures plain.

The cloth room should be kept the cleanest of any department in the mill, because it is the place where the cloth is out for the inspection of the public, and the buyers as a general thing take notice of these things, and if things in the cloth room look neat and nice, why should the cloth not look the same? The overseer should give instructions through his second hand, and if he hasn't a second hand, let his conversation be brief and to the point, and do not converse too freely with your help.

MANAGING THE CARD ROOM.

H. E. W.

I think the card room is one of the most important departments in the cotton mill. A carder has many problems to solve and sometimes some serious ones, and I think a great number of them are his own fault. The trouble usually commences in the opening room. The carder or overseer—as you choose to call him—should have competent men in this department to see that the cotton is properly mixed, and not done in a careless way. He should have have a steady set of men to attend to the picking machines, who are not out every day or so because if he has to change men on these machines very often, he will have trouble in keeping the laps at the proper weight.

The laps should be run at a regular weight, and the heavy and light ones set aside and run again. I think the overseer should have the man running the finishing machines to weigh ten or twelve laps every day in his presence from those he has sitting around, and then he could see if there was any trouble. Machines are made adjustable to suit the different grades of cotton and weather, and the overseer should be on the alert to detect anything that is not working right. He should see that the help under him are not allowing the machines to run without adjusting them to suit the conditions, until the spinner or some one else in some other part of the mill tells him he has trouble.

The overseer should have competent men to guind his cards; men who understand their duty should see that they properly grind and set them. Card boys should not be allowed to go along and put in all their laps at once, but should put one in now and then, for if they put them all in one after another they will have a lot of very heavy and irregular work going through, which will make trouble.

A good plan would be to have the card grinders pay some attention to the way the boys put the laps in for they are the ones that have to get the cards in running order when they get choked up through this carelessness.

Cans at the cards should never be allowed to run too full, but should be doffed at a regular time. If allowed to run too full so that the sliver rubs the coiler too hard, it will tear and break the fibers and will also make lots of waste. I have seen cans that have run so long that when they were doffed the cotton would raise about twelve or fifteen inches above the top of cans and fall off on to the floor. This surplus is often thrown into waste.

The section man around the drawings should be a man that knows how to handle the machinery and help under him, and the overseer should hold him responsible for quantity and quality of work that leaves his machines. The overseer should see that the section hand does not allow the help to make long piecings when cans are running out, as I have seen lots of trouble caused from bad piecing.

It would be a good plan for the overseer to make a few sizings for himself every day. He should see that the cones on the slubbers and are set just right, and that the belts are heavy enough to drive without slipping. If he wants to avoid trouble here, he will instruct his section men and all the help that have to creel on speeders to have one row of rovings full and the other half full on the back of speeders and not have both running out together. A good plan is to twist the ends together and not stick them in, for I have seen lots of trouble caused from this kind of creeling.

The overseer should be working for something else besides his salary, and should always have in mind, and impress upon the men under him to send out of his department, the very best that machines and help can make.

If the overseer will travel around his room often and see that everybody is attending to his work, I think his troubles will decrease.

HOW TO BE A SUCCESSFUL OVERSEER.

BY P. W. P.

Rules laid down by one overseer to be followed by another will never work; but there are general rules which if worked out on a common basis and carefully followed by all managers of help will be beneficial to the help and also to the overseer. An overseer must remember that without his help his room can not run. He may be a thoroughly informed man in his department, also may be a skilled man practically, but if he can not govern his help, and get the best out of them, his knowledge and practicability is useless. Therefore the importance of this question.

I will give as well as I can and in as few words as possible, what I consider the best general rules to be followed by an overseer in regard to his help.

First.—He must remember that while perhaps mentally and socially they are his inferiors, yet they have all the qualities of a human being and should be treated as such. They have their ideas of right and wrong and should be lead rather than driven.

Second.—When explaining any detail about the work it should be done in such a manner as to impress on the operative his or her importance and responsibility to the company. Never be afraid of telling the operative the ins and outs of his or her work, because the more they know, the easier the position of the overseer becomes, and also a better quality of work will be produced.

Third.—In reprimanding a hand, it should be done in such a manner that the overseer can hold the respect of the hand, and at the same time command the situation. This he can never do by losing his temper and using abusive language. If an overseer has rebuked a hand for something, and finds that he (the overseer) is in the wrong, he can, without losing his dignity, retract his statements and by so doing he makes a friend of perhaps one who would be an enemy.

Fourth.—An overseer can and must have a cheerful look when the work is going wrong, as well as when everything is running smoothly. Being cheerful in the midst of many difficulties is one of the hardest lessons to learn, but for one to be a leader he must bear all things cheerfully. In this manner his help will keep in a cheerful mood and be ready to do all that is asked of them, and respect and like the overseer. There is one evil to be guarded against, and that is do not be too familiar with the help in the room. Do not have favorites but treat them all alike.

These are just perhaps leading topics which could be enlarged, so as to cover many points, but if these are taken into consideration by any overseer, I will guarantee that he will enjoy the best wishes of his help and also of his employers. Remember that a man shows his true self to the world by the manner in which he treats his inferiors.

NEW MACHINERY AND TRADE NOTES.

A STEAM AND AIR FLOW METER.

Over a hundred years have passed since James Watt perfected a steam engine with practical operating qualities, yet up to the present time in neither the generation, transmission or utilization of steam has the just due of operating economy been realized. The engineering profession is proud of the many advances made in the construction of boilers, the provision of suitable steam transmission equipment and the perfecting of highly efficient engines and turbines; but in the really vital point—measurement—the engineer has had to be content, like Watt, with the knowledge that enough steam was being generated to do a certain amount of work. Though he has kept an accurate record of coal and water consumed by boilers, he has had no means of knowing how much steam was being delivered to the prime mover, how much utilized and how much wasted.

The necessity for the conservation of our national re-

FIG. 1. A BRASS NOZZLE PLUG USED WITH THE STEAM FLOW METER.

sources and the sharp competition which makes every economy, however slight, a matter of great importance impressed the engineers of the General Electric Company over four years ago with the fact that a means of doing away with guesswork in handling steam would be a wonderful boon to the engineering world. Experiments were undertaken at that time with a view to perfecting a practical steam meter, and as a result of over a thousand actual tests and the expenditure of large sums of money, such an instrument is now on the market. There have been developed a recording steam flow meter, two types of indicating steam flow meters and an indicating air flow meter, each of which will accurately measure the rate of flow of steam, air or other gases, as the case may be, in any size pipe, under any conditions of pressure and temperature met in commercial practice.

The principle governing the action of the flow meter is a modification of that of the Pitot tube. A brass nozzle plug screwed into the pipe at the point where the flow is to be measured carries two sets of openings: a leading set, facing the direction of flow and extending diametrically across the pipe; and a trailing set, consisting of two openings at ninety degrees and one at 180 degrees to the direction of flow. The impingement of the steam against the leading openings sets up in them a pressure equal to the static pressure plus the pressure due to the velocity head, while the trailing set is acted on by the static pressure less that due to the velocity. The difference in these values is a measure of the velocity, and for constant temperature and pressure gives the rate of flow. The pressures existing in the two sets of openings are communicated through separate longitudinal tubes to the outer end of the plug and from there by one-fourth iron pipes to the meter.

Recording Steam Flow Meter, Type R, Form D, is a curve drawing instrument, accurately calibrated to record the total rate of steam flow in pounds per hour in any diameter pipe at any condition of pressure, temperature or moisture. In this meter there are two cylindrical hollow cups filled to about half their height with mercury and joined together at the bottom by a hollow tube. This U tube is supported on and free to move as a balance about a set of knife edges. The two pressures obtained by the nozzle plug are communicated to the cups by flexible steel tubing, whereupon the difference in pressure is equalized by a rising of mercury in the left-hand cup and a falling in the right-hand cup. Due to the displacement of the mercury, the beam carrying the cups tilts on the knife edges until the moment of the counter weights on the extreme right of the meter exactly balances the moment caused by the displacement of the mercury in the left-hand cup.

The motion of the beam is multiplied by levers and is registered by a pen. The time element of the meter consists of an eight-day clock driving a drum and feeding paper at the rate of one inch per hour. Charts are supplied in sizes to measure a flow of from 2,000 to 240,000 pounds per hour, and of sufficient length to last one month. The rate of flow can be read at any instant or the average rate of flow calculated for a given time. The meter is adapted to any condition of pipe diameter, pressure, superheat or moisture by a hand adjustment of a correction weight on a graduated arm. A chart supplied with the meter shows the correct position for any existing condition.

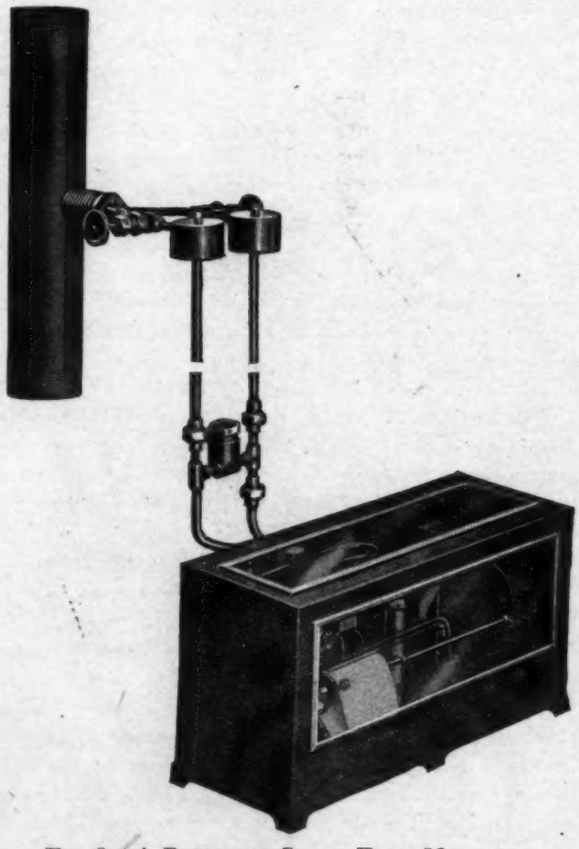


FIG. 2. A RECORDING STEAM FLOW METER.

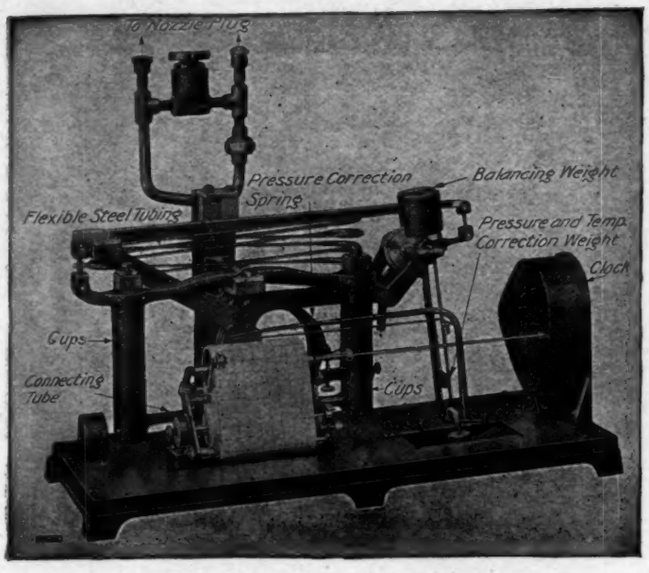


FIG. 3. RECORDING STEAM FLOW METER, SHOWING AUTOMATIC PRESSURE CORRECTION DEVICE.

If the pressure in the steam main varies more than ten pounds from normal, compensation is necessary for the error thus introduced. An automatic pressure correction device, consisting of a hollow spring, similar to the pressure spring in a steam gauge, is connected so as to be influenced by the static pressure of the steam at the point where the flow is being measured. Any variation of the static pressure causes the spring to expand or contract, and this movement actuates the small correction counter weight and affects the movement of the pen in such a manner that the recorded rate of flow is correct. The meter weighs fifty-five pounds complete and is finished in nickel and dull black. As the glass front of the cover is removable, the working parts of the meter are readily accessible at any time.

The Type I, Form F, Steam Flow Meter will meet general requirements where an indicating rather than a recording instrument is required. Owing to its simplicity of construction, light weight and durability, it will be found especially useful for testing work, locating leaks, etc. The meter will indicate the rate of flow of steam in any size pipe, under any conditions of temperature or moisture at the pressure range for which the individual meter is designed. These ranges are: low pressure, ten to forty pounds absolute; medium pressure, twenty to eighty pounds gauge; high pressure, seventy-five to 225 pounds gauge. The meter consists of an iron casting, cored out to form a U tube, and partially filled with mercury. The difference in pressure, as transmitted from the nozzle plug, causes a difference in the mercury levels, and the displacement of the mercury actuates a pulley by means of a small float suspended by a silk cord. The pulley moves a small U magnet on the end of the shaft next to the dial in proportion to the change in level of the mercury in the U tube. The indicating needle is mounted in a separate cylindrical casing. The pivoted end consists of a bar magnet, free to turn in the same plane as the magnet on the inside of the meter. The mutual attraction of the two magnets keep them parallel; a packed joint to transmit the motion of the pulley to the indicating needle being thus eliminated.

Proper adjustments for the existing conditions of pipe diameter, pressure and temperature are readily made by setting the graduated cylinder which actuates the rack carrying the pointer. When these settings are made, the rack is rotated by hand until the pointer coincides with the indicating needle. The point on the calibrated dial at the intersection of the needle and pointer gives the true instantaneous rate of flow in pounds per hour per square inch pipe area. This meter is finished in nickel and black japan and weighs only twenty-five pounds.

The Type I, Form F, Indicating Air Flow Meter is identical in principle and method of operation with the Type I, Form F, Indicating Steam Flow Meter, except that water is used in the U tube as a working fluid and the chart dial is calibrated to read in cubic feet free air per minute at 70 degrees Fahr. per square inch of pipe area. The air flow meter is made in two ranges: low pressure twelve to thirty-five pounds absolute and high pressure ten to 120 pounds gauge.

All meters are carefully calibrated at the factory for operation under steady flow conditions, such as occur in supplying steam to steady flow turbines, to heating systems, for manufacturing purposes, etc.; and it is not necessary to recalibrate the meter after installation. They will not, however, accurately measure a periodically intermittent flow, such as is required by intermittent flow turbines, reciprocating engines, pumps, etc. In such a case, unless the meter can be placed so close to the boilers that steady flow conditions exist, recalibration for the existing conditions is necessary after installation.

Station piping arrangements are not interfered with whatsoever in installation, since it is necessary only to drill a half inch hole in the pipe and insert the nozzle plug. The plug must be placed in a straight run of pipe at least ten pipe diameters from a preceding elbow or tee, and at least two pipe diameters before a following tee or elbow. The same nozzle plug is used for all types of meters, steam or air, the only difference being in the method of piping to the meter. The steam meter can be placed at any desired position below the level of the nozzle plug, provided the one-fourth inch iron pipes to the meter have a slight downward slope throughout. As the piping for an air meter is not filled with water, the air meter can be placed at any desired position whatsoever, above or below the nozzle plug. To operate the same meter on different sizes of pipes, it is

FIG. 4. AN INDICATING STEAM OR AIR FLOW METER.

thus necessary only to obtain the proper size nozzle plug for the pipe to be metered. Some of the many uses for which these meters are adapted can be summarized as follows:

For recording the total amount of steam generated by a battery of boilers.

For equalizing the load on individual boilers of a battery.

For discovering internal leaks in boilers, as shown by the difference in the water input and the steam output.

For determining the deterioration of efficiency of a boiler due to formation of scale, etc.

For determining the efficiency of stoking, etc.

For measuring the amount of steam sold for power, heating or manufacturing purposes.

For discovering losses originating from leaks between boilers and points of consumption, which could not be otherwise detected, as in defective traps, gaskets, valves, etc.

The great value of these meters has already been demonstrated in many instances. In one remarkable case the boilers of a factory consumed one-quarter the amount of coal on Sundays, when the factory was completely shut down, as on week days, when in full operation. Of course, the engineer knew that steam was being lost, but was unable to locate these leaks in the several miles of all sizes of steam pipes. The Steam Flow Meter located the leaks and effected a very considerable saving in steam. Meters have been tried out in more than fifty power plants and factories and found thoroughly practical, being accurate, easy to install, interchangeable under all conditions, light, economical, cheap and possessing a long life.

ECONOMY IN THE USE OF RE-NEW LAMP.

The renewal of the burned-out incandescent lamp has been attracting the attention of all consumers of carbon lamps for the last twelve years, and the progress made in this line has been very noticeable. Before the renewal principle was made practicable all consumers of incandescent lamps would throw away their burned-out lamp, thinking it was of no value. But since it has been made manifest that the bulb can be utilized again by the insertion of a new filament, consumers who have looked into the matter of cost saving have become assured that the renewal of a carbon in a burned-out lamp is in every way practicable, and can reduce the cost from thirty to forty per cent. in lamp maintenance.

Renewal of an incandescent lamp compares exactly with the renewal of a carbon in an arc lamp, the wick of a kerosene lamp, the main-spring of a watch or blade of a knife. Parties using arc lamps would not think of destroying their globes, but would insert a new carbon. Those using kerosene lamps would not throw away their font and chimney but would insert a new wick. The man who by misfortune had broken the main-spring of his watch would not throw it away. This is the case in the renewed lamp; why throw away the bulb and labor entailed to make it when the process of the insertion of a new filament, with the same apparatus for exhaustion and testing methods, are used as in the manufacture of the new lamp? The second wick of a kerosene lamp does not take any more oil than the first wick, if of standard quality; the second carbon of an arc lamp takes no more current than the first, if of the same quality, and so it is with the renewal of the incandescent lamp. The standard filament is used and the same process of manufacture is used, the only difference being that the manufacturers of renewed lamps do not assemble and make the bulbs.

The Re-New Lamp Co., Malden, Mass., who have established their name throughout the country and who are said to be the largest manufacturers of renewed incandescent lamps, state that when consumers understand the situation, irrespective of prejudice, they can not see why the properly constructed renewed lamp is not absolutly as perfect as a new lamp, and in consequence there has been a material increase in the resuscitation and rebuilding of incandescent lamps.

These statements may be new to some consumers of incandescent lamps and those who may read this article will not lose by investigation. In fact, Wilson S. Howell, Manager of the New York Electrical Testing Laboratories, states that his experience for three consecutive years has proven to him that a well constructed renewed lamp was equal to the new lamp. The Malden lamp has established a name throughout the country, three million or more of these lamps now being installed, which would seem to prove that this industry has received thought and investigation and proved a saving to the consumer, or they could not have established their foot-hold among so many varied manufacturers, central stations, office buildings, hotels, etc., throughout the country.

A TAR-ROCK FACTORY FLOOR.

The facility with which mill and other machinery can be fastened to a wooden floor, give rise to the use of such floors, even when the under position of the floor construction or the necessary strength is obtained from reinforced concrete. The usual method of construction in such cases has been to embed wooden nailing strips in the concrete, flush with the surface, and nail the floor planks to these strips.

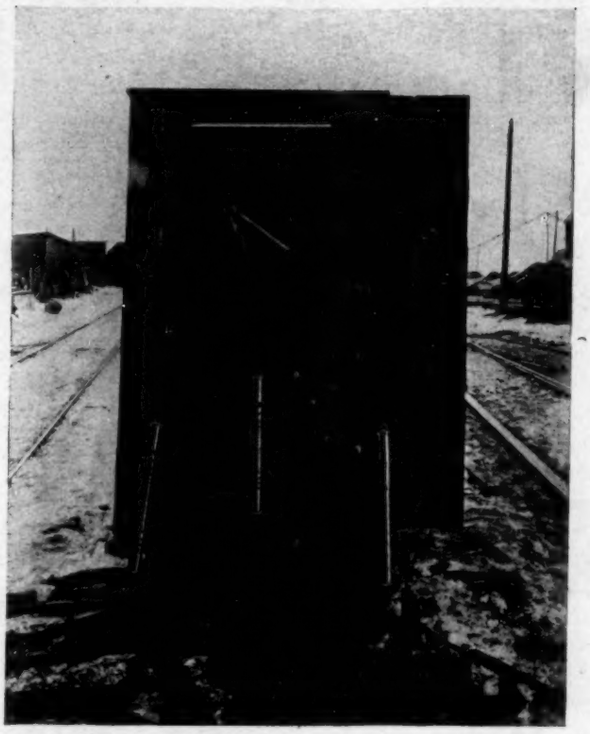
In making the plans for the Blake & Johnson factory at Waterville, Conn., the engineers, Griggs & Hunt, Waterbury, Conn., were confronted with the requirement of a four-inch wooden floor on the second story, although the floor panels themselves were to be of re-inforced concrete. The usual practice of using nailing strips as mentioned above was at first considered, but there is always danger of dry rot where wood is embedded in concrete, and protection against dry rot was essential. The method adopted was similar to that used under the lower floor in many factory buildings, and seems so admirably adapted to the requirements that it is strange that this method has not occurred to others to be used where the wooden floor is required on top of concrete.

For twenty or thirty years it has been the practice, where a wooden floor is required directly on the ground without space beneath, to omit sleepers and bed the plank directly on from one to two inches of sand mixed with sufficient good heavy coal tar to fill the voids in the sand. This not only protects against decay that would be caused by dampness from the ground, but the creosote oil in the tar also acts as a wood preservative. The foundation has often been of concrete but more usually of cinders or broken stone or gravel mixed with enough tar to make it compact well under a roller and provide a good, true and level surface for spread-

ing the sand and tar. The mixture of sand and tar provides a perfect bedding for the planks which are tied together as firmly by the hardwood wearing surface laid at right angles or diagonally as a single floor would be by the use of sleepers.

The adoption of this idea on the second floor of the Blake & Johnson factory is shown in the accompanying illustration. In this case the foundation (the re-inforced slab) was already in; all that was needed was something on which to embed the planks. Sand alone would not answer as vibration would cause it to shift; but by mixing tar with the sand this danger was overcome and the protection afforded by creosote oils in the tar was obtained. Barrett's sub-floor tar No. 5 was used and about 50 gallons mixed with each cubic yard of sand. The mixture was spread on about 1⅛ inches thick (so it would compact to an inch) leveled with a straight edge, and while it was still warm and soft the planks were laid on it and tamped until the proper level and stability were obtained. Following the 2-inch plank a ⅞-inch rough pine board was laid and then a surface of 1¼-inch square edge maple. If the experience of twenty or thirty years counts for anything, the planks in this floor will last as long as any part of the building, and if the hardwood wearing surface wears through in places, repairs will be a simple matter.

FIRE EXTINGUISHER.



VIEW SHOWING FIRE EXTINGUISHED IN ONE MINUTE AND 19 SECONDS WITH THREE "ECLIPSE" TUBES.

EXPERIMENTAL FIRE, ON WHICH WERE POURED FOUR 14-QUART PAILS OF KEROSENE, TWO 14-QUART PAILS OF LIQUID TAR, AND ONE 14-QUART PAIL OF TURPENTINE.

In the shape of fire departments there is no question but that they come high and yet very few of the smallest communities are without some system of fire protection which usually includes heavy apparatus which must be moved to the fire.

In order to obviate the delay caused in moving and arranging for service these heavy pieces of fire apparatus many devices have been invented which may be conveniently located within reach of the one who discovers the fire. Most fires are discovered when they are small, particularly those in textile factories which are more liable to fire when in operation than when the machinery is quiet. Buckets of water are perhaps the simplest of all forms of close at hand fire protection, but water fails where the fire is in oil, gasolene or grease, tar, pitch or rubber compounds. Next to the filled water bucket, a dry powder harmless to persons or fabrics, which may be thrown on the base of the fire is not only simple, requiring no manipulation, except throwing it, but much more effective, as it will do what water will not, extinguish fires in oils and other inflammable substances mentioned and there is no damage except from the fire itself. It is well known that the water drainage particularly in fires in textile establishments is frequently in excess of the drainage from combustion.

The illustrations show the efficacy of the Eclipse Dry Dust Fire Extinguisher made by the Haverhill Fire Appliance Company of Haverhill, Mass. These extinguishers are in use in some of the largest textile establishments, by the United States Navy and the largest railroad systems both steam and electric.

Requiring no knowledge of construction or operation or skill in handling and the powder remaining indefinitely without change or losing any efficiency, the tube can be pulled from its only support, a hook in the wall, which holds the cover and instantly, with a sweeping motion the powder is thrown on from the open end of the tube at the base of the fire. The heat liberates gas, which rises and displaces the oxygen, preventing any further combustion.

Excepting electricity, two-thirds of all fires are caused by oils, gasolene or naphtha, which water can not extinguish, and if applied, frequently tends to spread the fire.

Their use in many textile factories has saved much loss. For automobiles, garages and motor boats there is said to be nothing to equal the "Red Tube."

THE GLASTONBURY KNITTING CO.

The Glastonbury Knitting Co. was organized in 1853 and reorganized in 1881. The well-known trade-mark of the company was adopted in 1855, and the goods bearing that trade-mark are used extensively throughout the United States and Canada and enjoy an enviable reputation that has long been a pride to the company. This knitting mill started in a very small building, operating two sets of wool cards. In those days the carding, spinning and knitting were done in the mill, but the finishing of the goods was done outside, material being sent out to different families where there was an experienced hand for that kind of work. In those early days, the mill was turning out about from twenty to twenty-five dozens of garments per day.

The growth of the company since its reorganization in 1881 has been marked by a steady increase in equipment, and a demand for the standard Glastonbury underwear has been such that the plants have had to be enlarged each year to meet the demand for the product. The original spelling of the name, "Glastenbury," was taken from the name of the town in which the knitting mill was located, but the spelling has since been changed to Glastonbury.

The product of the concern consists of flat goods only for men, made of fine wool and merino in natural and camel hair in winter weight. Also a light wool and merino for spring and fall is manufactured. At the present time the mill is operating 18 sets of cards and turning out 100,000 dozens per year. The plants are equipped with the latest improved machinery from the picking to the finishing department, and every process of manipulation from the raw material to finished fabric is performed in the plant.

In 1909 an addition was made to the main plant at Addison, Conn., consisting of four stories 100x60 feet, for enlarging the facilities of the picking, spinning, knitting and finishing department. Two brick warehouses were also built, being 100x50 feet, two stories high. A number of double tenement houses for the operatives were also completed. The company plans to build a large addition to the Manchester plant in the near future to accommodate four sets; and contracts have recently been let for two double tenement houses at the Addison plant. Another addition to the Addison plant will probably be made in the near future. The officers of the company are as follows: Hewitt Coburn, Jr., President and Assistant Treasurer; Edward W. Scott, Vice-President; Sylvester C. Dunham, Second Vice-President; Jas. W. Halstead, Treasurer, and Elmer A. Robertson, Secretary.

FARBENFABRIKEN OF ELBERFELD CO., New York City, has recently issued some very interesting color sheets for 1910. The dyes relating to cotton are as follows: Diazo Fast Violet BL, suitable for all kinds of cotton material, especially for the dyeing of loose cotton and yarn, which are intended for fancy woven goods. It is dyed in the same manner as other Benzo colors, diazotized and developed, generally with Develpor A. It is noted for its good fastness to light, washing and cross-dyeing. Katigen Direct Blue R.F. extra is used for all kinds of cotton material, such as loose cotton, yarn and pieces, as well as on linen and half-linen. It is especially valuable for dyeing cops and cheeses in machines. This brand is dyed direct, without any after-treatment, and yields a very fine, bright, blue shade, which is both redder and clearer than that of the Katigen Blue B. Algole Red R extra paste is suitable for all kinds of cotton material required to possess good fastness, such as loose cotton, yarn and cops as well as piece goods. It produces a very clear shade of good fastness to light, washing, boiling, cross-dyeing and chlorine. This dye also produces excellent fast reds on silks, and in addition is adapted for direct printing on cotton with Rongalite C.

The pattern sheets showing dyes used for piece dyeing and printing are as follows: Para Brown 3 G. is dyed on cotton with Glauber's salt and soda in the jig or open vessel. It is adapted for coupling process with Paranitraniline. Its excellent fastness to washing and light are worthy of mention. Para Brown G.K. is especially adapted for working in the slop machine.

A large number of Katigen colors used for printing are shown on a ten-page card. The process of printing is said to be remarkable for its cheapness and simplicity, since the glucose is used as a reducing agent; and starch, made soluble with caustic acid, as a thickening medium.

The dyes used for wool, shown on different pattern sheets, are Acid Chrome Violet B, which has good fastness to washing, milling, carbonizing, stoving, steaming and light. It is generally dyed according to the one-bath method. Violet and prune shades may be obtained from this dye as a self color, but it is better employed for shading the Acid Chrome Blue and Chrome Cyanine brands, etc. Alizarine Rubinole 3G gives a fine, clear, red shade. It is dyed with Glauber's salt and sulphuric acid or bisulphate of soda, but may also be used for shading mordant colors. White cotton effects are not tinged; silk effects also remain a pure white when dyeing with acetic acid. Chromoxane Green 2G is distinguished by its excellent fastness to potting, as well as by good fastness to washing, milling, stoving and steaming. It is dyed with an addition of Glauber's salt, acetic acid and sulphuric acid, and after-treated with bichrome. White cotton effects in woolen pieces remain clean. Another sheet showed the Anthra Cyanine colors which have good fastness to light and good leveling properties in the dyeing of ladies' dress materials. The new colors combine excellently with one another or with other good level-dyeing colors fast to light. They are also adapted for dyeing yarn when same has to undergo only a light washing. White cotton effects in woolen pieces remain perfectly clean, as do white silk effects when dyeing with an addition of acetic acid.

COTTON AND WOOLEN MILLS are using Mica Flake Lubricant for the reason that it will not of itself damage or soil the finest fabric or material, and even when mixed with oil will not blacken or discolor. Graphite, while admittedly a good lubricant, is said to have weaknesses that Mica Flake has not. Mica Flake will not cake or harden. It is light and economical, as it weighs only about one-fifth as much as any other lubricant in equal bulk. Mixed with oil or grease Mica Flake actually separates the two metal surfaces of the journal and axle—keeps them apart—thus reducing friction to the minimum. It will cool quickly while running the most stubborn case of hot boxes.

Mica Flake Lubricant is manufactured by the United States Mica Co., 240 LaSalle St., Chicago, and this concern has made a very fair offer to our readers to try Mica Flake. They will ship a ten-pound can to you by express, prepaid, on trial, for 30 or 60 days. If satisfactory you pay for it, otherwise return it to them at their expense and your obligation ceases and no charge for amount used.

The demand for Mica Flake Lubricant in the South has increased so rapidly that the manufacturers have decided to carry a large stock of it at Charlotte, N. C., from which all shipments to points in the South will be made promptly.

JOHNSON & WALKER, 27 Exchange St., Providence, R. I., have recently made arrangements with a Southern mill to handle their entire product of combed Sea Island yarns. This amounts to about 8,000 lbs. a week in 20/2, 30/2, 36/2, 40/2, 50/2, 60/2s in skeins on tubes or cones or in ball or chain warps so desirable for mercerizing for the knitting and weaving trade. This mill can also furnish yarns for the tire trade in numbers 20/1, 22¾/1, and 23/1. Inquiries may specify any twist desired. The quality of product is not surpassed. The mill is located where the finest grade of Sea Island cotton is grown and occupies the unique position of growing the staple and carrying it through every process to the specifications in the order with unvarying satisfaction to the purchaser.

Johnson & Walker not only furnish these yarns in the natural state, but are in position to carry out any detail of finish.